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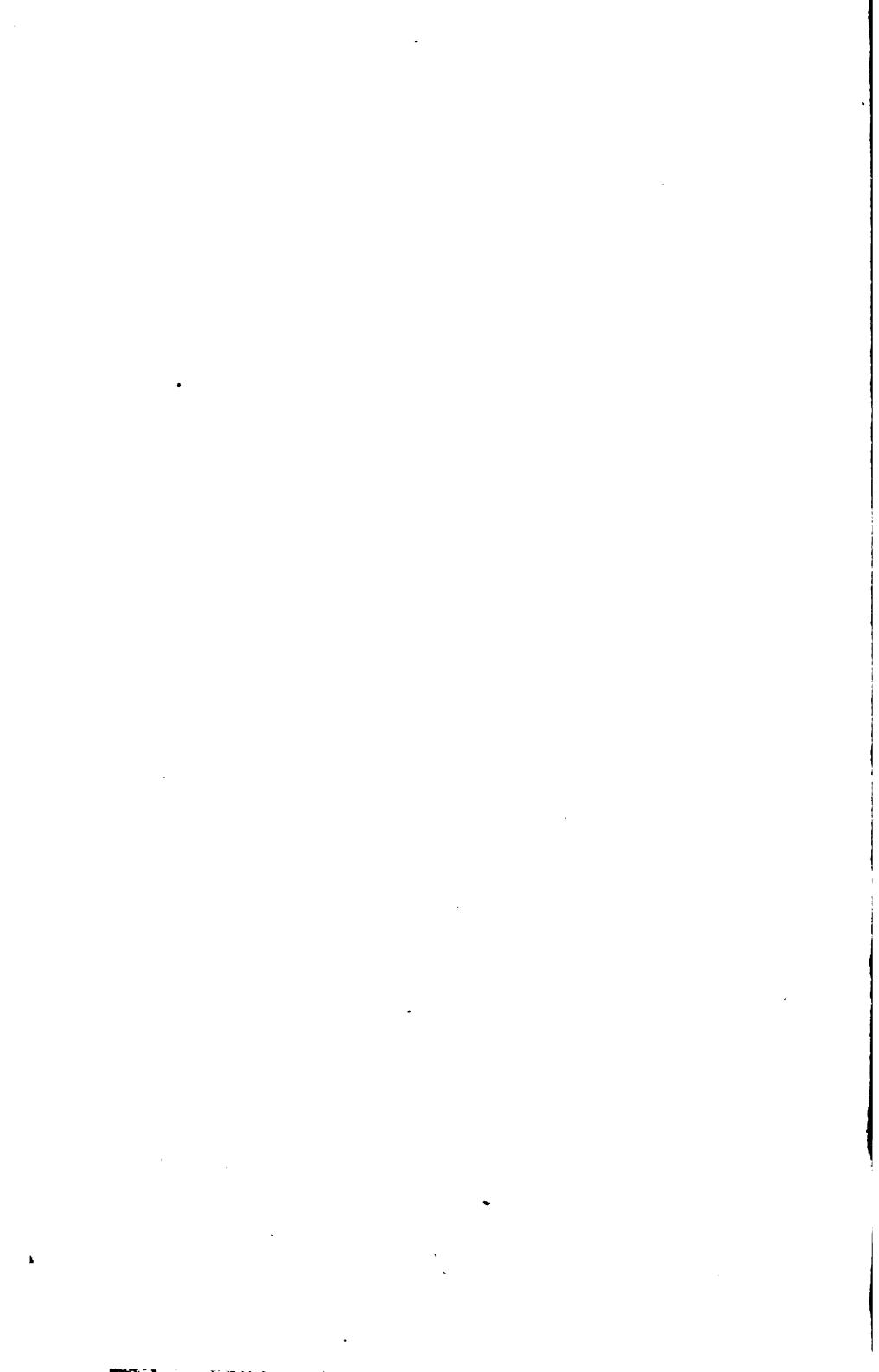
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OBSERVATIONS
IN RELATION TO
A COMMUNICATION
BETWEEN THE

ATLANTIC AND PACIFIC OCEANS,

THROUGH THE
ISTHMUS OF TEHUANTEPEC,

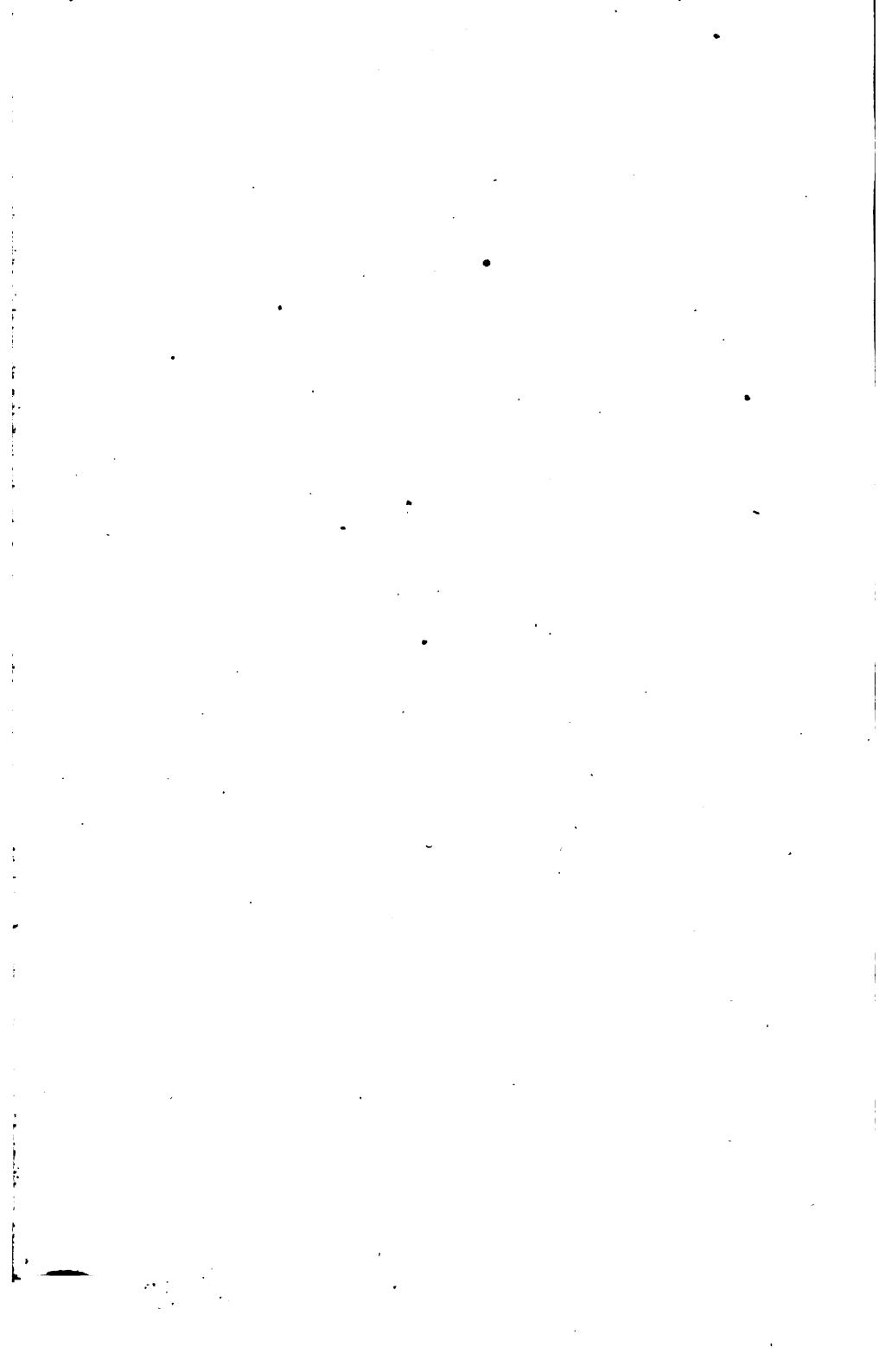
FOUNDED ON A REPORT ON THIS SUBJECT BY

SEÑOR GAETANO MORO,

UNDER WHOSE DIRECTION A SCIENTIFIC SURVEY OF THE
ISTHMUS WAS MADE.

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NEW YORK:  
R. CRAIGHEAD, PRINTER, 112 FULTON STREET.

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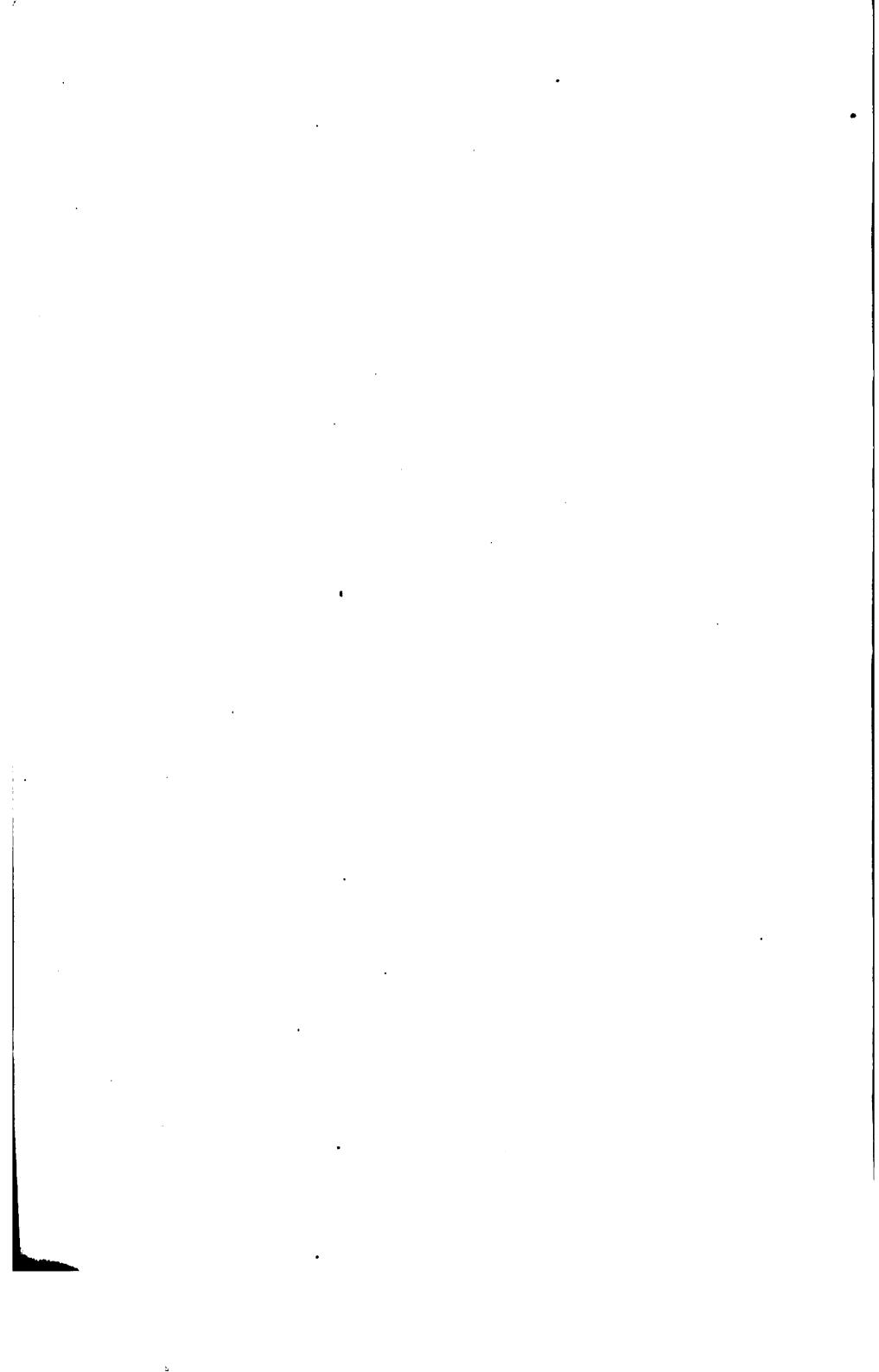
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P R E F A C E .

THE idea of making a direct communication with the Pacific having taken possession of the minds of the people of the United States, it follows, as a matter of course, that it will be accomplished. As much capital, however, will have to be expended in effecting this project, it is of every importance that the route to be adopted should be selected with great care, and after a deliberate examination of the various routes proposed. The routes submitted to the public should be examined, not only in regard to their practicability and cost, but also in relation to their utility after being made: for it is clear that if the Pacific and Atlantic oceans are connected by a route *judiciously* selected, great results of a commercial, political, and moral nature must follow. It is very desirable, therefore, that every information in relation to the different projects of connecting the two oceans should be brought to the notice of the public.

There can be no doubt that the interests of the United States will require at least two roads—one by land, terminating at some well selected point in our possessions on the Pacific, and another across some part of the Isthmus which unites the two great divisions of America. This last may be considered the oceanic communication, and will be the one through which a large portion of the commerce of the world will pass; for a safe and commodious communication once opened, the rich and profitable trade with Asia will be entirely revolutionized, very much to the advantage of American capital and enterprise. It will possess the great merit, too, of being made at much less

expense, and in much shorter time, than the land route—a point of great importance to the people and the government, in relation to their possessions on the Pacific. The interests of the people imperiously demand that some short communication should be established, with as little delay as is consistent with a careful examination of the several proposed routes.

In this spirit the following pages are presented to the public, with the view of calling its attention to the route by the Isthmus of Tehuantepec. The statements as to its topography, climate, and productions, are taken from the report of a survey of that Isthmus, executed under the direction of Señor Gaetano Moro. Wherever it was possible, the statements are given in the very words of Mr. Moro. It is to be regretted that the scope of the present publication does not allow more liberal extracts from his very interesting report; for all that he has written is worthy of being read.

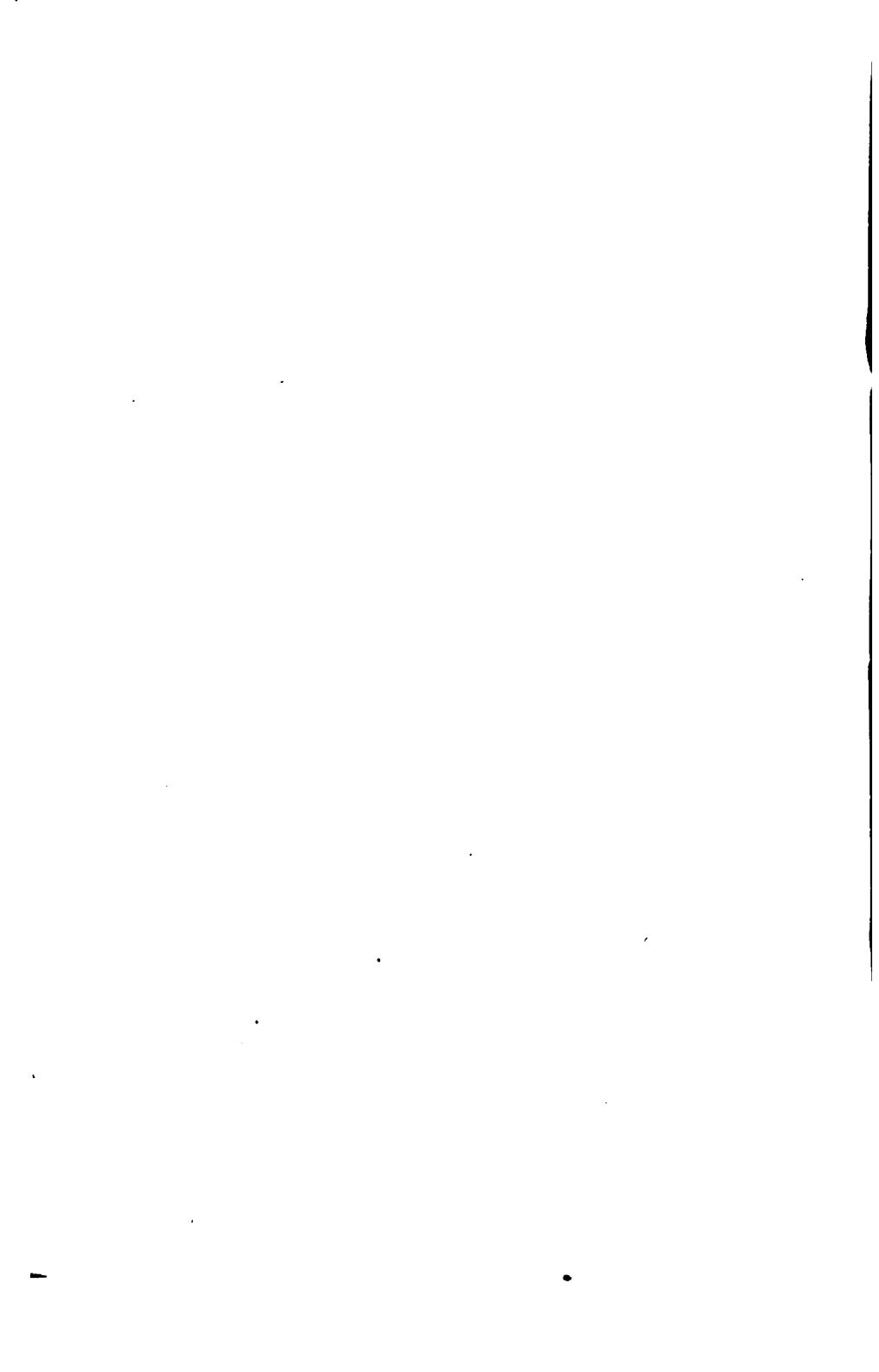
The surveys were made with a view to a ship canal, the practicability of which was satisfactorily ascertained, after a scientific investigation. The necessities of commerce will require that, at some future day, a communication should be opened by means of a *canal*. In this age of wonderful improvement and of bold enterprise, great results are effected within a small compass of time, and therefore it may be said with confidence that the day is not remote when this great undertaking will be accomplished. The mode of communication now proposed to be adopted is that of a railroad, the practicability of which is established by the surveys of Mr. Moro.

Three maps accompany these pages. The first presents a topographical view of the Isthmus of Tehuantepec, as deduced from the surveys of Mr. Moro, and shows the physical aspect of that section of the country. The second shows the relative position of our seaports on the Atlantic and in the Gulf to the several proposed routes—the distances by the different proposed routes, showing how much nearer the route by Tehuantepec is to our possessions on the Pacific than by any other. The third is a geological map of the southern part of the Isthmus. The tables of Trigonometrical and Barometrical altitudes are

accompanied by an explanation of Mr. Moro, as to the instruments used, and the mode pursued in obtaining the results.

During the last session of Congress, a petition was presented to that body by P. A. Hargous, Esq., of New York. The object he had in view in presenting it, and what he proposes in the end, will be well understood by the following extract from that petition :

“ In addition, your petitioner will forthwith take the necessary steps to obtain all proper guarantees from the Government of Mexico for the security of the rights of the company which he proposes to form ; in which he has entire confidence that he will succeed, as he knows that the Mexican people are not only favorably disposed to the projected road, and have a full perception of its importance to their country, but are anxious for its completion. If such guarantees are obtained, he will immediately organize an American company for the construction of the road, and he has not the slightest doubt that the requisite amount of stock will be subscribed, and the road forthwith commenced. In the meantime, he does not desire to precipitate the Government of the United States into any contract until full assurance is given of the completion of the road ; but he only asks that the Government will not hastily commit itself, without a full knowledge of all the advantages of the road which he proposes to construct, in comparison with any and all others.”



ISTHMUS OF TEHUANTEPEC.

EVER since the discovery of America, the idea of connecting the Pacific and Atlantic Oceans has occupied the attention of man. Monarchs on their thrones—Navigators on the ocean—Merchants at their desks—Men of science in their closets, all have had their attention turned to the consummation of this great project ; and indeed, from the prodigious results which must flow from its accomplishment, it was well worthy of all the attention which could be bestowed on it. Various enterprises have, from time to time, been set on foot to open this desirable communication between the two oceans, as yet with no practical result. This has arisen partly from the gigantic character of the undertaking—making it too much for individuals to accomplish ; but principally from the fact, that no nation had a sufficient and positive interest in its accomplishment to induce any government to undertake it. Indeed the fear of rival commercial interests has induced each government in its turn to avoid any participation in it.

A new era, however, has dawned upon us, offering the most favorable auspices for a speedy and certain accomplishment of this great project. The settlement of the Oregon boundary and the acquisition of California by the United States have made it the interest of the people and the government to effect this great enterprise ; and thus, while certainly promoting the one, this young republic will have the glory of accomplishing a project, first suggested by the illustrious discoverer of this continent, but which up to this time has baffled the exertions of man. It would seem as if, in the designs of Providence, the accomplishment of this great undertaking was to be effected by citizens of the two republics of North America, certainly of all the nations of the earth the two most interested in the project of connecting the two oceans.

In the history of man, it has always been observed that great

events are preceded by the circumstances which prepare the way for their accomplishment. The settlement of the Oregon boundary and the acquisition of California constitute one of these circumstances. The other is one, from which our sister Republic of Mexico will have a full share in the glory which will result from a connexion of the two oceans; for, as if in anticipation of the development of those events, which would lead to this great result and on her part to aid in its accomplishment, the government of Mexico in 1842 made a most liberal grant to one of her most distinguished citizens, Don José de Garay. The spirit of the grant is worthy of the enlightened age in which we live, and reflects the highest honor on the Mexican Republic; for, disregarding those interests which are purely selfish, she has opened the advantages resulting from the oceanic communication to the citizens of the whole world. In other respects, the conditions of this grant are such as to offer the strongest inducements to capitalists and to men of enterprise to embark in the construction of a railroad across the Isthmus of Tehuantepec. The honor of the Mexican Government is pledged under the most solemn guarantees to carry out all its provisions in good faith to the grantee, and to all those who may acquire rights under his grant. There can be no doubt, that if any other measures are required at her hands to give efficacy to the grant, they will cheerfully be made; for her high character as a nation and her clearest interests equally conspire to induce on her part full aid and co-operation in the successful accomplishment of this great work. (The terms of the grant will be found in the Appendix marked No. 2.)

A primary condition imposed on the grantee Don José de Garay was that he should "cause to be made at his own expense a survey of the ground and direction which the route should follow, and also of the ports which may be deemed most commodious."

Mr. de Garay, as will be seen from his eloquent memorial—to be found in the Appendix No. 1—was deeply impressed with the vast results which would grow out of this magnificent project, presenting to his mind, as it must to every one, results as beneficent and as extensive to man, as the discovery of the new world has effected, great and astounding as they have been.

Mr. De Garay was determined, so far as depended on him, that no expense or other means should be spared in obtaining

all the necessary information, and that every measure in procuring the preliminary knowledge should be conducted so as to secure accuracy and should be pursued in a spirit commensurate with the great results which he had determined to accomplish. He therefore resolved to employ gentlemen known to the scientific world as the most eminent in their profession, and established a board composed of the following gentlemen :

SIGNOR GAETANO MORO, *Director.*

LIEUT. COL. DE LA TROUPLINIERE, & } *Engineers.*

CAPT. GONZALEZ of the Staff Corps, } *Engineers.*

DON PEDRO GARAY, First Officer of the Ministry of War, as
Secretary and Treasurer.

DON MAURO GUIDO, Lieut. of the Navy, *Assistant.*

To whom were also added Don Manuel Robles of the Engineer Corps and Professor of Astronomy, and Geodæsia of the Military College of Mexico ; and Don Andres del Rio, who classified the geological portion of the survey. This last had been the friend and companion of Baron de Humboldt in Mexico.

The instructions of Mr. De Garay to this board were to take nothing on rumor, but to bring everything to the test of personal observation. With all the appliances necessary for the surveys, which the liberal proprietor had amply provided, the commission set out for Tehuantepec on the 30th April, 1842, and continued from time to time their explorations in the field, and reducing their work, for a period of eighteen months.

Under this board, topographical, geological, and hydrographical surveys were made. The object of the present publication is to furnish to the public a condensed view of the results of these surveys, showing :

1st, The practicability of the route across the Isthmus of Tehuantepec.

2^{dly}, The resources in the country for the construction of a railroad.

3^{dly}, The climate and productions of the country.

4^{thly}, The advantages of the Tehuantepec route as to distance, and moreover in a commercial and political view as affecting the interests of the U. States.

Accompanied by maps.

It may be well here to remark, that these surveys have attracted the attention of many of the scientific bodies in Europe. They were brought to the notice of the British Association for

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the *Advancement of Science*, held in York in 1844, by the President of the Royal Geographical Society of London, in terms of commendation. In like manner the learned astronomer, M. Arago, gave them his attention, and says of them, "*The surveys of Mr. Moro and of his assistants seem to have been made with every desirable care, by the best methods and with excellent instruments.*" Finally they were submitted to the distinguished Geographer, Baron de Humboldt, who took much interest in them, which is not surprising, when, as every one knows, this idea of connecting the two oceans was one of his cherished hopes.

The report of these surveys has been well received and spoken of in the most flattering terms by men of science, distinguished for their practical knowledge in such matters; in addition to which, almost all the scientific publications have spoken of it most favorably.

I. THE PRACTICABILITY OF THE ROUTE.

From the surveys made, it appears that the entire distance from sea to sea is 135 miles in a straight line, and presents a wide plain from the mouth of the Coatzacoalcos to the foot of the Mesa de Tarifa (a table land or elevated plain on the line of the Andes), which rises to a height of 650 feet above the level of the sea, and at the distance of five miles, descends again to the plain, which reaches the Pacific.

The survey commenced on the side of the Pacific near Tehuantepec. Here Señor Moro found two extensive lakes; the outer separated by a narrow sand bank from the ocean, and the inner and larger communicating with it by a narrow channel between high banks. The entrance into the former is called the Boca Barra, and the communication between the two lakes is named the canal of Santa Teresa. It has been clearly ascertained that both these may be easily deepened so as to admit vessels of the largest class. Both lakes form capacious, safe, and commodious harbors. Eight rivers flow into them.

From the shores of the inner lake, the ground rises very gradually to the Venta de Chicapa, whence it rises with steeper acclivity, entering upon the table land of Tarifa by the pass or Portillo de Tarifa. From this point, after proceeding five miles

across a plain, the ground begins to descend, but not so rapidly as on the side of the Pacific, and continues to fall till reaching the confluence of the Malatengo and Coatzacoalcos; the slope is almost imperceptible to the shores of the Atlantic, the river falling only at the rate of ten inches per mile for the whole distance.

The character of the river Coatzacoalcos will show the practicability of this route. This river is navigable for ships drawing 12 feet water for about 34 miles from its mouth. No one ever visited this river, Mr. Moro remarks, whether acquainted with these matters or not, without being impressed with the facility with which the whole of it might be made navigable.

"The gentleness of the current may be inferred from the fact, that its course with all its windings from the confluence of the Malatengo to the sea, measures 258,000 metres with a fall only of 40, namely, 0.000155 of descent for each metre of course."

The characteristics of the river afford the surest guarantees for safe and commodious harbors, and offer the strongest encouragement to undertake the removal of the few impediments, which for the present obstruct the navigation by vessels drawing more than twelve feet water. This, it is to be remarked, is the depth on the bar in the dry season, for in the wet season the depth of water is much increased. It is believed that steamers can enter the Coatzacoalcos at almost any time. Commerce can be carried on here as advantageously as at the entrance into the Mississippi from the Gulf, at the mouth of which river the soundings are from 12 to 16 feet, which are the soundings on the bar at the mouth of the Coatzacoalcos.

In relation to the bar at the mouth of this river, Mr. Moro remarks: "It has been observed that the bar of the Coatzacoalcos is permanent, and in the plan of its course made in 1825 by General Orbegozo, we find, after a lapse of eighteen years, that the same windings exist throughout. The islets and streams are also identical both in number and importance, which seem to promise, that whatever works may be necessary to give greater depth to the river will have a permanent result if they are well conceived and properly executed."

Mr. Moro has examined with precision, the character of the obstruction at the mouth of the Coatzacoalcos and the other two in its course, and says, that "I cannot, however, look upon the difficulties as very great, for I am thoroughly convinced that

they would be neither arduous nor expensive to overcome. The many efficient means employed in similar cases are too well known to allow of much importance being attached to such obstacles."

In addition to all this testimony of Mr. Moro as to the character of the Coatzacoalcos, it may be well to mention, that the first geographer of the age, the distinguished Mr. Balbi, considers the Coatzacoalcos "as the finest port of all the rivers which discharge themselves into the Gulf of Mexico, not even excepting the Mississippi itself." There is this great advantage in the Coatzacoalcos over the Mississippi, that there is no floating or fixed timber in the bed of the river. Its current also is gentle and the waters of the river clear.

The absolute practicability, in an engineering point of view, and the certainty that safe and commodious harbors can at a comparatively small expense of time and money be made both on the Gulf and Pacific sides, being by these surveys clearly ascertained, it may be well now to examine—

2. THE RESOURCES OF THE COUNTRY FOR THE CONSTRUCTION OF A RAILROAD ; AND THE NATURAL PRODUCTIONS OF THE Isthmus.

" The entire course of the Coatzacoalcos is through the midst of a dense forest, which can supply immense quantities of timber of every description, suitable for the construction of a road. The luxuriance and majestic appearance of the forests bordering on this river are beyond all description, and as Don Tadeo de Ortiz has well observed, they exhibit ' a truly monstrous vegetation of which ocular inspection alone can give an adequate idea.' In close proximity are the productions of the tropical climate, and ascending to the table land, there are found those of the temperate regions. The oak, cedar, pine, in its several varieties, iron wood, the laurus sassafras, the Brazil wood, the mahogany, as will be seen from what follows, are found throughout the several localities of the Isthmus. Abundance of the finest quality of live oak can be procured here."

In the Peninsula of San Mateo and Santa Maria, the most remarkable plants are the tamarind, the palm, the cocoa-nut. The land to the north of the lower eastern lagoon, in which the estates of the Huaves of San Dionisio and San Francisco are

situated, appears clothed with a luxuriant vegetation, somewhat resembling that of the parks of Europe.

“Between the Coast and the Sierra, the plain is partly covered by acacias, which, as we shall presently see, might furnish a considerable quantity of gum.”

“On approaching the Sierra, the vegetation is more vigorous, and the Brazil wood tree (*cæsalpinia crista*), of which large quantities might be obtained, becomes very common. The granadillo, the mahogany tree, (*svictenia mahagani*), the copalchi (*croton cascarilla*), the bark of which is a well known febrifuge, and the dragon tree (*pterocarpus draco*), begin to make their appearance, as well as many other shrubs unknown to me, that yield resins and balsams, to which the natives ascribe the most marvellous virtues. There are also the fustic (*morus tinctoria*), and according to Don Tadeo Ortiz, the logwood (*hæmatoxilon campechianum*), as well as a considerable number of other trees, both picturesque and useful for their flowers and the hardness and durability of their wood.”

“Both the soil and the climate are favorable to the cultivation of sugar-cane and indigo, and those tracts of land which are protected from the winds produce cotton of superior quality.”

“The table land and hills between the Tarifa and the Barrio appear covered with good grass, which affords excellent pasture for cattle. The dales are covered with palm-trees, and a little higher up, we find the ocote pine (*pinus religiosa* ?), which has some affinity with the *pinus picea*. The latter tree is also found on the summits of the hills between the above mentioned places and Santa Maria Chimalapa, alternately with the trees of ~~the~~ plants which grow in the lower portions of the grounds.”

“It is impossible to describe with effect the luxuriance of the vegetation in the latter places ; but among the prodigious multitude of plants, however, the *guayacan* (*diospyros lotus*), the cedar, the mahogany, the rosewood, the *gateado*, and the ebony, are particularly abundant. No less worthy of notice are the amber tree (*liquidambar styraciflua*), from which is extracted the resin of the same name, and the tree yielding the balsam of Peru (*myroxylon peruiferum*), and the ocozotl, producing a gum very similar to the true amber.”

“Innumerable species of fruit trees also luxuriate here, among which are found two kinds of vine bearing fine flavored grapes,

the plantain, the orange tree, two species of spontaneous cocoa (theobroma cacao), and the sapota tree of various kinds. The abundance of these is so considerable, especially that of the mammee sapota, that the Indians are accustomed to cut down the tree to gather the fruit more readily.

"There are likewise several kinds of indigoferas; the bixa orellana, from which the annatto is extracted, the sarsaparilla (*smilax salsaparilla*), the ginger (*amomum zingiber*), and two kinds of vanilla, which is very common, and which at this time has no value there. This valuable plant is also found in great abundance on the hills west of Petapa."

"The Cerro Atravesado has on its summit a table land, at the northern extremity of which rises an isolated peak. It is covered with excellent pasture grass and a splendid wood of Ocotes. The fissures by which this table land is intersected, are constantly supplied with delicious water by the frequent rains, and when these are considerable, the superabundant water falls perpendicularly over the western side, forming a cascade nearly one thousand metres in height. The edges of the fissures are richly ornamented with Zamias, ferns, and orquidaciæ of great beauty."

The southern side of the most elevated portion of the chain, Mr. Moro remarks, appeared to be profusely covered with majestic oak trees.

"To the right of the upper Coatzacoalcos, or Rio del Corte, are found in astonishing abundance various kinds of pines, and among them is the *pinus abies*, which the Spanish Government used to send to the dock-yard at the Havannah for the construction of ship masts. According to Don Tadeo Ortiz, many of these trees are from two to four metres in diameter, and of a prodigious height. They are found on the very edges of the banks of the river. The plains watered by the rivers Malatengo, Chichihua, and Almoloya, are noted in the isthmus for their delightful aspect. The soil and climate are likewise peculiarly adapted to the growth of maize, cocoa, tobacco, rice, and the sugar-cane.

"On the road from the Boca de Monte to the Mal Paso, the vegetation begins to assume an aspect peculiar to the plains of the Coatzacoalcos. The *laurus sassafras*, the fern tree, an infinite variety of palms, and the plants of the tropical regions already referred to, united and interwoven with passion-flowers,

and innumerable filamentous reeds, or richly enveloped and crowned by a multitude of exquisitely beautiful orquideas, formed an admirable and sublime spectacle."

"The Sarabia also runs through groves and woods of great beauty, the soil of which seems to be waiting only for the helping hand of man to yield with profusion the natural riches it contains."

"The other *natural* products of the Isthmus, such as wax, honey, raw silk, cochineal, caoutchouc, furs, tortoise-shell, coral, and pearls, may be had for the gathering. The sugar-cane, tobacco, maize, and rice are produced with the slightest care on the part of the inhabitants in great abundance. The soil is so fruitful, that both Don Tadeo Ortiz and Don Jose Maria Inglesias assert that the efforts of the cultivator are in some places rewarded with five annual crops of maize, being respectively called tornamil, tepachole, temporal, tepeta, and etopil. Señor Ortiz, speaking of this fertility, says, 'that which most particularly characterizes this privileged region, however, is the singular fact that one single sowing of rice will yield successively two large crops, without the slightest additional labor, as I had an opportunity of observing in the Rancho de Gavilanes, situated in the strand between the Coatzacoalcos and Toneladas.'"

Wild cattle, game of every description, such as deer, rabbits, wild turkey, pheasant, the quail, wild pigeons, and wild ducks, are in the greatest quantity; and the rivers, lakes, and shores of the ocean contain a great variety of the finest fish.

Another of the *natural* productions of this region ~~of~~ ^{of} very deserves to be noticed, on account of its value to the inhabitants, as because it can be made a profitable article of export. The salt pits are so numerous that it would be difficult to determine the quantity they are capable of yielding. It is no exaggeration to say that from Huamelula to Tonala, the entire intervening space is one continued salt mine. While Mexico was under the dominion of the crown of Spain, they were worked to great profit. The salt obtained from them is highly esteemed in various parts of the Republic, both for its purity and whiteness. It can be obtained at little cost, for being a spontaneous production, the only capital required is the labor to get it out and take it to the point whence it is to

be exported. There is no doubt that when a line of communication is established across the Isthmus and between the ports in the Gulf, that a profitable trade in this production might be carried on to Havanna, New Orleans, and through this last port the valley of the Mississippi could be supplied. It could also advantageously be carried to ports on the Pacific, which are now supplied with this article at great cost."

"But, among all these productions," remarks Mr. Moro, "the timber of its immense forests deserves particular mention. Its abundance is such that the only limit which can be assigned to the supply it may yield, is the demand for centuries to come. From the fir, the oak, and every variety of ship timber, to the dye and fine grained woods, their profusion is almost incredible. It was from the fact that the Spanish Government used to obtain the *pinus abies* for the use of its naval dépôt at Havannah, from the banks of this river, that it received its alternative name of *del Corte*. None of the countries which at present supply these species of woods, as articles of commerce, could compete with the Isthmus, for here the different species are found on the very banks of the river, which of course facilitates their carriage, whereas everywhere else, a long period of felling must make them remote from the channel of conveyance. It was with timber obtained in this Isthmus that Cortes built on its southern portion the vessels with which he discovered the Californias."

In a geological point of view, all the proper materials necessary for the construction of a road, such as limestone—clay of a suitable texture—asphaltum, and excellent building stone, are all found in great abundance, and are placed—as if purposely by nature to accomplish this great enterprise—close to the points where they are most needed. Iron is also found in the Isthmus, and there are strong indications that coal exists there. The Zapotecos and other Indians of the Isthmus were employed by the Commission of Survey, and found to be willing and intelligent laborers in the duties assigned to them. Labor in sufficient quantity of this description can be had at moderate wages, say from 25 cents to 50 cents a day. Mules and oxen are also found in great numbers. Vegetable and animal food for the supply of man can be produced there, and in all its varieties.

3. THE CLIMATE.

In the southern part of the Isthmus, the climate of that portion which extends from the ocean to the Sierra, being open to the south and sheltered in the north by the Andes, is warm ; but the heat is dry, and to this, no doubt, it owes its remarkable salubrity. The thermometer sometimes in particular localities ranges as high as 92°, a degree of heat with which the northern cities of the United States are annually visited ; but in the Isthmus, this heat is so much qualified by the breezes from the mountains as to make it in truth a delightful climate." "The climate of the elevated section of this part of the Isthmus is so different from that of the plains, that when the thermometer stands in the latter place at 30° Centigrade, equal to 85° Fahrenheit, it scarcely rises to 13° equal to 56° of Fahrenheit at Chivela or Tarifa. In all the heights surrounding these estates, we find the pine ocote, the presence of which clearly indicates a very temperate climate. This considerable difference of temperature appears much more strange considering that the absolute elevation of Tarifa is not more than 200 metres, whilst its latitude is less than 17°. Our surprise ceases, however, when it is remembered that Tarifa participates in the temperature of the Sierra, which, near to it, reaches suddenly to an elevation of more than 2,300 metres."

" The summits of the Sierra Madre are almost constantly enveloped by the clouds, which coming from the Atlantic there discharge themselves, a circumstance that accounts for the rivers of the Isthmus having an almost constant body of water during the greater part of the year. At Guichicovi and Santa Maria, Chimalapa, it rains almost incessantly and often also at San Miguel. Whenever such is the case, the table-land of Tarifa is covered with a kind of thin mist, which disappears upon reaching the Portillo, where the reigning wind becomes more powerful. This phenomenon may be considered permanent, the suspended mist rarely extending beyond the table land of Tarifa. Thus the Venta enjoys an almost unclouded atmosphere, and rain seldom falls in the plains."

" The climate of the northern division of the Isthmus is damp, but its temperature being generally low, compared not only with the southern division of the Isthmus, but even with the other coasts of the Atlantic, it is by no means unhealthy, as its position would lead one to suppose. The Centigrade thermometer does

not reach in these regions more than 30 degrees—85° Fahrenheit; the most prevalent diseases are intermittent fevers, but no instances have hitherto been known of the yellow fever, endemic in other countries.

Robinson, who knew well the locality, said in reference to this subject: "If, on a topographical survey of the Isthmus, it shall be found practicable *to cut a canal*, there is no place where such an undertaking could be accomplished with such ease as in the province of Oajaca. In its boundaries are comprehended a great part of the Isthmus of Tehuantepec. Its salubrity is unequalled on the American continent. Even its shores on the Pacific Ocean appear exempted from the usual diseases which afflict the inhabitants of the Atlantic and south sea coasts."

"It cannot fail to be observed, that among the advantages offered by the Isthmus of Tehuantepec for the execution of the proposed work, is that of a mild and healthy climate precisely in those localities where the assistance of laborers of the European race would be most required. The light rains of Tarifa and of the valley of San Miguel are not of sufficient consequence to impede the continuation of the work during a considerable portion of the day.

"During the long sojourn of the Commission in the Isthmus, the persons composing it had often to undergo hard and severe toils, and were frequently exposed to the most trying inclemencies of the weather, and yet neither themselves nor their numerous attendants experienced any illness, indicative of an unhealthy climate."

The importance of fine climate cannot be over-estimated in a work of this kind, both as it affects those concerned in the work, and those who afterwards use it for the purpose of travel and commerce. No other route in this respect can compare with Tehuantepec.

Before leaving this subject it may be well to state, that the Isthmus of Tehuantepec forms part of the departments of Oajaca and Vera Cruz. That portion of the Isthmus which is in the department of Oajaca is the southern division of the Isthmus, and that which is in Vera Cruz constitutes the northern division of the Isthmus as referred to from time to time in these pages.

It may be well here also to observe that it was in this Isthmus that Cortes located the lands granted to him by the crown of

Spain. These estates are called *Haciendas Marquesanas*, from being entailed in favor of Hernan Cortes, Marquis del Valle, and whose descendants enjoyed them up to a late period. When it is remembered that with this sagacious man originated the idea of a communication of the two oceans through this Isthmus, there can be but little doubt that he who knew so well its topographical advantages, made this selection of his lands here, from the conviction that through this channel the communication between the two oceans would be effected.

The Advantages of the Tehuantepec Route as to Distance, and, moreover, in a Commercial and Political View, as affecting the Interests of the United States.

The distance from the mouth of the Mississippi to San Francisco, by the Isthmus of Tehuantepec, is 3,850 miles ; by the Isthmus of Panama, 5,675, making a difference in favor of Tehuantepec of 1,825 miles. The distance from New York, by the Isthmus of Tehuantepec, is 5,250 miles ; by the Isthmus of Panama, 6,650, thus saving between New York and San Francisco, by the Isthmus of Tehuantepec, 1400 miles of sea navigation. In a commercial point of view, the saving of time, the difference of provisioning a vessel for a short, instead of a long, voyage—the same difference as to the quantity of coal required for the short voyage of steamers, and the saving of insurance, would, of itself, be sufficient to give the preference to the route by the Isthmus of Tehuantepec.

The day is not far distant when a canal or railroad will be made across some portion of the Peninsula of Florida, which, of course, will make the distances from New York still more in favor of the route by Tehuantepec.*

* Since the above was written, it appears a company is about to be formed to construct a railroad from some point near St Mary's, on the Atlantic, to some point on the Gulf, in the neighborhood of Cedar Keys. A glance at the map will show that from Cape Hatteras across by this route is a *straight* line to the mouth of the Coatzacoalcos.

Great as this advantage is, it is not the only consideration which should decide the preference of one route over another as a line of transit. Not the least important is proximity to the country whose people or Government will undertake it. The other inducements for giving a preference are the facilities which the route proposed to be established offers for the construction and repair of the road—for obtaining laborers and supplies for them—the spontaneous productions of the soil—constituting themselves articles of commerce, and as furnishing the raw materials to be converted into valuable articles of trade by man's industry—salubrity of climate—facility of protection to our commerce in time of war. These are some of the advantages which the route by Tehuantepec offers.

It is believed that with a good carriage road across the Isthmus of Tehuantepec, passengers and freight could safely and more expeditiously reach San Francisco than by any other route, possessing even a railroad.

The importance of this route, in this point of view, is already attracting the attention of the public. A good road is now being opened, which, no doubt, will be made in the course of the summer.

It has been stated that, in former days, a good road went from the Gulf to the Pacific side, and, during its existence, the Isthmus enjoyed a high degree of prosperity. This was natural, because the soil was fruitful in such valuable and various products, as to lay the foundation of a profitable commerce.

As steamers, no doubt, will be employed as the means of transportation on the Gulf and Pacific sides, the facility of obtaining coal in any required quantity, and at moderate prices, is a matter of great importance. In taking this route, coal can be obtained not only at moderate prices, but what is better, the cash for its purchase will go into the hands of our own citizens. Depôts of this necessary article—if indeed coal itself be not found in the Isthmus—could be easily established within the Coatzacoalcos, all of which would be obtained from New Orleans.

By this route, too, we would never have to leave our own waters—for the Gulf of Mexico may be considered for us a great internal lake. From New Orleans it is almost in sight, by a direct and short line, and thus all the commercial advantages resulting from the trade with the Pacific across the Isthmus,

would enure to the benefit of our own citizens. By other routes, distant and foreign harbors would have to be resorted to, for the purpose of shelter, repair, and supplies, and the commerce thus carried on, instead of securing to us *all* the benefits resulting from it, would be aiding to build up our rivals in commerce. Now it is well enough—in a proper spirit of liberality—to let the commerce of the world be free to all who choose to compete for it; but it surely is folly in us to foster rival interests, without one single motive or object to justify it.

In time of war, the advantages of this route are so obvious as to require but little comment. With our naval forces at the entrance of the Gulf, we could defy the world, and thus, while war might devastate and destroy outside of this Mediterranean sea of ours, commerce would carry on its peaceful pursuits, without interruption or molestation, within. By means of the great Mississippi and its tributaries, and by the numerous artificial communications of railroads and canals, connecting the West with the Atlantic States, even in time of war, every portion of the United States, to the remotest point of Maine, could carry on its trade through this channel.

By any other route, our vessels would be sailing amidst hostile fleets and forts, without harbors to resort to, either for the purposes of shelter or repair. These remarks, which apply to our commercial marine, have the same force when applied to our naval forces.

In a political point of view, the necessity of cultivating the most friendly relations with our Sister Republic of Mexico, are strikingly obvious. Conterminous nations, above all others, should have with each other the best understanding. We are the two Republics of North America, with organic constitutions precisely similar, and although the younger Republic of Mexico has difficulties to encounter, in carrying into practice the principles of her constitution, from which we are fortunately exempt, it cannot but be the desire of every political philanthropist amongst us, to see her successfully establishing her government on that sure foundation, which has secured for us glory as a nation, and the promotion of the best interests of our people. Whatever exalts Mexico in the rank of nations, while it contributes to her honor, will be grateful and useful to us; whatever develops her industrial resources, while it will promote the interests of her own citizens, will benefit ours.

In former days, States held relations with each other for the purpose of promoting and perpetuating particular dynasties. In our days, nobler objects constitute the motive for preserving friendly relations with foreign powers. Commerce, carrying in its train the blessings and the lights of civilization, is the great object in our relations with nations, and, at the same time, it constitutes the strongest bond of peace and good will between them. Commerce, founded on just and reciprocal principles, is calculated to excite more energetically the industry of man, and, by this means, to develope resources calculated to add to his happiness, which, but for its fostering influence, would remain unknown. The productive resources of Mexico are, as yet, but faintly developed; but all who know the character of its climate—the fertility of its soil, with its varied and valuable productions, and the great mineral resources of that country, must see in them the basis of an extensive and lucrative commerce, which, in a moral and commercial sense, can, to great advantage, be reciprocally exchanged between the citizens of the Mexican Republic and those of our own country.

It must be remembered, however, that it is not simply commercial intercourse, but it is *frequency* of intercourse, and the *intimate relations* which this frequency of intercourse produces, that develops, to its fullest extent, *all* the beneficent influences of commerce. By means of this, the individuals of nations become better acquainted with each other—prejudices are removed—affinities are established—and thus the highest results of commerce, as affecting man in his moral character, are fully developed.

The establishment of a line of transit across the Isthmus, through her territory, under the combined guidance of the skill, capital, and enterprise of her and our citizens, happily occurs at this moment to realize all those anticipations so beneficial to humanity, and will be the motive to induce Mexico to establish the most friendly relations with us. Mexico, once the favorite vice-royalty of Spain—the first Republic of the Spanish dominion on the Continent of America, has been the first to show those enlarged views, which, while they will promote in a signal manner the interests of her own people, will secure those projects which will benefit man in general.

Another view akin to this, and leading to the same happy results, connected with the route of Tehuantepec, is highly

worthy of the notice of the people of the United States. The Mexican Government, with a feeling of liberality in the highest degree commendable, has decreed, by the 6th condition in the grant to Mr. de Garay, that "All foreigners are permitted to acquire real property, and to exercise any trade or calling, not even excepting that of mining, within the distance of fifty leagues on either side of the line of transit. That territory shall be the country of all who may come to establish themselves there, subject, however, to the laws of the Republic."

The inducements of climate and soil, the fine water power which this country possesses, the cheapness of labor, and the large and lucrative commerce which will be carried through the Isthmus, will, no doubt, cause this country to be settled by a hardy, enterprising, industrious population, and that at no distant day. The people of this Isthmus are keenly alive to the importance of this work, and are desirous that all the purposes of the grant should be carried out to their full extent. With this people, useful relations can be established between us—not so with others at a distance from us.

No time could be more propitious for this great undertaking than the present. We are at peace with Mexico, and it is the hope of every friend of humanity—for the good of both countries—that it may be an enduring peace. We are at peace with all the nations of the earth. The energies of man can, therefore, be devoted to the industrial pursuits of his nature: capital is abundant, seeking for investment, and it can in no way be better employed than in forming this great connexion of the two oceans. Of all others this is the time, when our enterprising citizens are going in thousands to our possessions on the Pacific shores, there to create new resources to swell the products which will pass over this route, and from the enterprise of our citizens taking a wider scope, to pour into the lap of commerce the rich and varied products of the Asiatic world, hitherto obtained at vast labor, great delay, and much expense.

In all these important aspects, the practicability, capability of the country to furnish materials for the construction of the road, advantages of its climate, of proximity to our own land, and the political and commercial relations which will be established by it, the route by the Isthmus of Tehuantepec offers superior advantages which cannot be overlooked.

This short description of the Isthmus of Tehuantepec cannot be better brought to a close than by the observations which Mr.

Moro makes in relation to it. He says—"On inspecting the map of the American Isthmus, the idea naturally suggests itself, that the narrowest portions of it are those which would probably offer the greatest facilities for the opening of a communication, and from this circumstance they have always attracted a greater share of attention. Repeated surveys having, however, proved that under these deceptive appearances were concealed difficulties almost insurmountable, the public mind has, at last, become accustomed to consider the enterprise as one of the most gigantic.

"The recent survey of the Isthmus of Tehuantepec has proved beyond all doubt the fallacy of this opinion. Well aware, notwithstanding, that a deeply rooted prejudice is not easily eradicated, I felt the more anxious, when the truth of the practicability of the work presented itself forcibly to my mind, after the most careful and oft-repeated observations, to impart to others the intimate conviction which I felt upon the subject, and in this spirit I penned the report which has been since published. My efforts have not been altogether fruitless ; public feeling in favor of a work anxiously looked for during three centuries, has been once more revived by the prospect of increased facilities for its attainment. Men of science and practical knowledge in various countries, both of the Old and New World, have given their careful attention to the subject, and freely expressed their unqualified assent to my views, through the medium of the public press ; and the probabilities of success no longer rest on my bare assertion, unsupported by the testimony of high authority.

"Works which, though of great magnitude, are of undoubted and acknowledged public utility, fail only to be undertaken whilst there exists a doubt of their practicability ; the latter once established, the execution *must* follow, sooner or later, in the natural and infallible order of things. Something beyond mere supposition leads me to place the opening of the Isthmus of Tehuantepec in the number of such undertakings ; the question, therefore, is not whether the work can and will be accomplished, but *who* shall undertake it ; and, under these circumstances, it should be borne in mind that the nation whose citizens shall have more immediately contributed to the accomplishment of this great work, will naturally acquire in the Isthmus a most advantageous position."

A P P E N D I X .



D O C U M E N T S .

(No. 1.)

Memorial of Don José de Garay, soliciting of his Excellency, the President of the Mexican Republic, the Privilege of opening a Communication between the Atlantic and. Pacific Oceans through the Isthmus of Tehuantepec, and Decree granting the same.

SIR,

Your Excellency has caused the Mexican public to look forward to the present epoch as one of improvement and gigantic advancement in the career of national aggrandizement.

No measure can be more fruitful in prosperous results, none more memorable or more glorious, than that which shall form a junction between the two oceans, without the necessity of doubling that stormy cape, which forms the southernmost extremity of the American Continent.

Thousands of ships yearly perform this difficult and tedious voyage, passing twice through the tropics, in the midst of innumerable and imminent dangers.

The mind is bewildered with the difficulty of embracing in one comprehensive view, the astonishing consequences that would result from a communication between the two oceans, by means of which ships sailing from Europe will save two thousand leagues, and those from North America, three thousand one hundred leagues, in their voyages to the coasts of China. What an economy of time and money! And how far will these advantages extend, now that the lines of steamboats established upon the high seas have so prodigiously shortened distances!

A great revolution will take place in the commercial and even in the political affairs of all nations, the instant America shall open the passage through any of her isthmuses. The epoch which shall see this effected will be more memorable than that of the discovery of this Continent, and the name of him to whom the world shall owe this event, will be at least as glorious as that of Columbus.

If your Excellency is ambitious of this glory for yourself and your country, you should now dedicate your attention and the powerful mind with which you are endowed to the execution of the enterprise contained

in the present representation, and to which is annexed the project I have conceived for forming a communication between the two oceans.

By this your Excellency will see that I propose to execute this grand work in a very short time, considering the magnitude of the enterprise ; that I ask not the least pecuniary assistance from the government ; and that from the commencement I offer to the national treasury a considerable revenue : viz. one fourth of the net profits which may arise from the dues and imposts to be collected on the line of the route, and which dues and imposts will, after the term of fifty years, belong wholly to the Republic.

What I ask as an indemnification of expenses is certainly not much, when it is recollected that it will be necessary to form ports, raise fortifications and various other edifices, and open roads and canals ; and when it is borne in mind that the indemnification does not consist in any valuable property of which the government is at present possessed, but in property to which I must create a value.

Should the lands of which I solicit a grant, come to have a value hereafter, my exertions will have caused this effect, for at the present day they have none whatever.

The enterprise could not be undertaken for less than what I have solicited, because the magnitude of the works will be such as probably to absorb the resources arising from what I ask.

Your Excellency cannot fail to remark two very striking features in my project. First, the establishment of the lands to be conceded for the enterprise into a neutral territory : this is a point worthy of the magnanimity of government, and necessary to interest all nations, in order that the communication may not be seized by any foreign power, but be ever preserved as the property of the Republic. Secondly, that I have not proposed to open immediately a ship canal across the Isthmus ; because I have seen this project abandoned in other parts of Central America and Columbia, for it had to encounter invincible difficulties on account of its magnitude. Desirous of carrying into execution a very gigantic undertaking, a lesser, but still a grand one, has been neglected.

Convinced that it has been well and truly said that "*By grasping at too much, we often lose what is in our power,*" I have resolved to carry the latter into effect, without, however, renouncing my hopes of accomplishing the former. Although a communication by water will not be attempted for the present, this will infallibly take place when the Isthmus shall be well known to all nations as forming a convenient centre for carrying on the commerce of the whole world ; when the advantage of giving to this grand work all the perfection of which it is capable shall be duly appreciated ; and when both sides of the line of transport shall be dotted with rich and populous cities, as will certainly happen in a few years.

Let this be enumerated among the acts of your Excellency's public life,

and your name will not only belong to the glory of your country, but will be identified with the best interests of mankind, and immortalized by the most imperishable of monuments. The whole world will receive incalculable benefits: and what advantages will not accrue to America in particular, when the accomplishment of this undertaking shall make her the centre of universal commerce, giving a vast impulse to the elements of her territorial wealth and greatness, dormant as yet, and incapable of being developed from the little intercourse she at present enjoys with the splendor and industry of Europe!

I beg leave, sir, to repeat that the mind is bewildered and loses itself when it attempts to grasp the beneficial results that must accrue to Mexico on the completion of this project, from the facility with which her native products will be exported, and from her becoming the emporium of the commerce of the world,—as also from the immense sums arising from duties and other contributions, paid, not by the inhabitants of her soil, but by foreigners, and from the great influx of population and capital to which it will inevitably lead.

May your Excellency, therefore, become the author of these great and numerous benefits to your country, by adopting the articles of my memorial, and thus acquire the most memorable and well-founded of titles to an illustrious and patriotic career.

JOS. DE GARAY.

Mexico, February 25, 1842.

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(No. 2.)

Decree ordering the opening of the Isthmus, with the grants therein specified: and Contract between the Supreme Government and Don José de Garay.

(STAMP.)

In the City of Mexico, on the second day of March, in the year one thousand eight hundred and forty-three, I, the undersigned Notary national and public, being in the office of the Secretary of State for Foreign Affairs of the supreme Government of the nation, and in the presence of the said Secretary of State, Don José María Bocanegra, also Magistrate of the Supreme Court of Justice, he said: that his Excellency the President of the Republic, General of Division, Benemeritus of the Country, Don Antonio Lopez de Santa Anna, in the exercise of the authority conferred upon him by the seventh clause of the Convention of Tacubaya, sworn to by the Nation, and by the Representatives of the several Departments of the Republic, was pleased to issue and cause to be published with due solemnity the following:

(DECREE.)

" Antonio Lopez de Santa Anna, General of Division, Benemeritus of the country, and Provisional President of the Republic of Mexico, to all the inhabitants thereof,

Know ye, That firm to my purpose of aggrandizing the nation and of rendering the people happy, having before me the propositions which Don José de Garay has presented, and considering that no means are so sure and effectual for promoting the national prosperity as that of making the Republic the centre of the commerce and navigation of all countries, and that this must be the consequence of the establishment of an easy and short mode of transporting effects from one ocean to the other : As nature offers the means of accomplishing this, without opposing any great obstacles in the way of it, and without the necessity of incurring any vast expenses, in the Isthmus of Tehuantepec ; inasmuch as there the Cordillera dips or lowers itself to such a degree that it may almost be said to disappear, and that there are two harbors in these parts, one towards the north and the other towards the south, at a short distance from each other, a considerable portion of the space between them being easily transitable by means of a navigable river and lake, and the nature of the intermediate surface being very favorable to carrying on the works which it may be necessary to undertake, as it abounds in materials for construction :—And considering that if up to this moment public attention has not been properly called to this enterprise (which alone is capable of aggrandizing the Republic), it has, perhaps, originated in not having duly calculated the important consequences which must result from it, either because its execution has been deemed impossible, or that a prejudice existing in favor of making a cut through the Isthmus to join the two oceans, the advantages of a railroad or canal destined for the transhipment of goods, by which the same results might be approximately obtained, has been entirely lost sight of : And furthermore desiring, if more cannot be done, to accomplish what is practicable when it is of importance to the Republic and to the world in general : and seeking, by promoting the execution of what is at present attainable, to give an impulse to future attempts on a larger scale (for the opening of a line of communication, by tending to show that it is not difficult to cut across the continent, may hereafter conduce to the undertaking of this great work) : Feeling, besides, that in order to encourage the spirit of speculation, it is necessary to make concessions and confer privileges, by which alone enterprise has ever been fostered, and that by this enterprise in particular the nation will obtain revenues with which it cannot reckon at present, paid by the commercial interests of other nations, and immediately reap the advantages which must result from universal intercourse, when its soil shall become the emporium of commerce and consequently teem with wealth and abundance, when its various products shall become articles of

exportation:—*Therefore*, by virtue of the powers and faculties vested in me by the seventh article of the convention signed at Tacubaya and sworn to by the Representatives of the Departments, I have determined to issue the following:—

(DECREE.)

ARTICLE 1.—A line of communication shall be opened between the Pacific and Atlantic oceans through the Isthmus of Tehuantepec.

ART. 2.—This shall be performed by water, except where it is impracticable, when railroads and steam carriages shall be used.

ART. 3.—The passage across the Isthmus having been opened, it is hereby declared neutral and common to all nations at peace with the Mexican Republic.

ART. 4.—The execution of this work shall be confided to Don José de Garay: to whom is hereby granted an exclusive privilege to this effect. His obligations and indemnifications shall be as follow:—

FIRST.—Don José de Garay shall cause to be made at his own expense a survey of the ground and direction which the route should follow, and also of the ports which may be deemed most commodious. All which shall be concluded at furthest within the space of eighteen months from the date hereof: and the works shall be commenced within the space of ten months next hereafter:—and in case this should not be performed within the time specified, the exclusive privilege hereby conceded to him shall cease.

SECOND.—The said Don José de Garay shall cause to be made in the ports which he shall select all kinds of works that may be necessary for shelter and utility. He shall construct in each of them fortresses and warehouses: he shall carry into effect the line of communication between the two ports by means of water-carriage or railroads, in both cases by means of steam—and he shall establish as many steamboats and trains of steam cars as shall be deemed necessary.

THIRD.—The grantee shall pay at a just valuation for any private property through which the route shall pass; but he shall not occupy, on account of public utility, more than a quarter of a league on either side of the line, which is all he can require the proprietors to sell.

ART. 5.—The indemnifications which are hereby accorded to the grantee and to those who may acquire his rights or any part thereof, are the following:—He shall have the right of collecting the passage dues for the term of fifty years, at the expiration of which time they shall revert to the Government of the Republic: and for sixty years the exclusive privilege of carrying on the transport by steam-vessels and railroad cars, with the right of determining an equitable rate of freight. But he shall give to the Government, from the time that the line of communication shall be opened for the transport of effects, the fourth part of the net produce

of the receipts for this purpose, deducting the expenses of administration, preservation, and repair thereof. The Government shall also give a fourth part of the net profits to the Negotiation during a like term of fifty years, when it shall enter into possession of its before-mentioned rights over the line of communication. The Government and the Negotiation may each name their agents to look into the receipts and expenditures, during the whole of the time that each respectively shall be entitled to the before-mentioned fourth part of the profits. All the unoccupied lands for a distance of ten leagues on either side of the line of communication are hereby ceded in fee-simple to the Negotiation.

ART. 6.—All foreigners are permitted to acquire real property and to exercise any trade or calling, not even excepting that of mining, within the distance of fifty leagues on either side of the line of transit. That territory shall be the country of all who may come to establish themselves there, subject, however, to the laws of the Republic.

ART. 7.—The Government engages to give to the Negotiation every protection and assistance, as well for effecting the survey as for carrying on the works, but the remuneration of the services of the inhabitants of these parts shall be at the expense of the Negotiation. The Government also engages not to impose any contributions or taxes upon travellers or effects *in transitu*, until the expiration of the aforesaid term of fifty years, and not to levy upon the Negotiation or its funds any imposts or forced loans.

ART. 8.—The Government shall have the right of appointing the custom-house officers, which it may see fit, in the ports and in any other points it may choose on the line of communication: but only for the purpose of recovering the duties of importation and exportation upon articles which do not come and go merely for the purposes of transport and for preventing smuggling: and in no case shall they interfere in the collection of transport dues, nor in the collection of freights, lighterage or tonnage, or of any other class of dues; for none shall be payable by vessels loading or unloading for the transport of effects as long as the communication shall belong to the Negotiation. The measures which the Government shall take for the prevention of smuggling shall be such as to cause no embarrassment or delay in the transport of effects across the Isthmus, and particular regulations will be adopted and issued to this effect.

ART. 9.—When the works shall be completed, they shall be examined by two Surveyors, one to be named by the Government and the other by the Negotiation, in order that they may declare whether it has fulfilled the terms of the contract: and in case these shall disagree, they shall nominate an umpire who shall have the casting vote: but no kind of question or difference shall prevent the line of communication from coming into operation as soon as it shall be ready: and the Negotiation is always bound to fulfil the contract in every particular.

ART. 10.—In case it should hereafter be found practicable to join the two seas by a cut, and that propositions to this effect shall be made by any individual or any company, they shall not be admitted during the period of fifty years, for which the privilege is granted to Don José de Garay, without his previous consent or that of those who may have acquired his rights.

ART. 11.—The contract between the Government and Don José de Garay shall be drawn out in writing according to the tenor of the articles forming the basis of this decree, with all the formalities required by law.

Therefore I command that it be printed, published, and circulated, and duly carried into effect. Given at the Palace of the National Government this 1st day of March, 1842.

ANTONIO LOPEZ DE SANTA ANNA.

José MARIA BOCA NEGRA.

(CONTINUATION.)

“That for the fulfilment of the preceding decree, and in accordance with the enactments of the Supreme Government, it was determined to draw up and execute the title deeds to which it refers, effecting them in the best and most binding form, and therefore he declares that in the name and with the power of the supreme Government fully and extraordinarily authorized by the before-mentioned seventh clause, and by its especial tenor, he grants to Don José de Garay the exclusive power of opening and constructing in the Isthmus of Tehuantepec a communication between the Pacific and Atlantic oceans, with the obligations, rights, and advantages contained in the pre-inserted decree dated the 1st instant, conceding to him in full right of property and dominion all the waste lands in the Isthmus within ten leagues on either side of the projected communication, granting him also the same right possessed by the nation of making use of the private property for objects of public utility, that he may acquire the grounds necessary for the transit, including a space of one fourth of a league on either side, with due and previous remuneration to the proprietors according to valuation, and without regard to the increased value which the grounds may afterwards acquire in consequence of the projected works and the expenses incurred by the parties effecting the communication ; and under no excuse whatever will the government lay any tax or impost upon any of the articles passing through the Isthmus during the period in which the proprietors of the transit shall have the exclusive enjoyment of its proceeds, as well as the regulation of its tariff-rates, as mentioned in the seventh and eighth clauses. That in the name of the supreme government, and under the most solemn protests, he declares and promises that all and every one of the concessions mentioned in the pre-inserted decree shall be honorably fulfilled, now and at all times, pledging the honor and public faith of the nation to maintain the projector, Don José de Garay,

as well as any private individual or company, succeeding or representing him, either natives or foreigners, in the undisturbed enjoyment of all the concessions granted, holding the National Administration responsible for any acts of its own or its agents, which from want of proper fulfilment of the covenant might injure the interest of the proprietors, all of course subject to the exact tenor of the inserted decree. And Don José de Garay being also present, and whom I hereby certify I know, said that he had accepted, and again accepts, the above mentioned contract, and solemnly submitted to all and every one of the conditions therein expressed, according to the tenor of the pre-inserted decree of the supreme Government; and he willingly consents to forfeit the privileges granted to him, and whatever sums he or those who might succeed him should have advanced, if by any unforeseen event the line of communication shall not be established; and he is also willing that the enterprise should be held bound to fulfil all that is here agreed upon. And his Excellency the authorized minister of state and the same Don José de Garay, in their respective capacities, renounce any laws in their favor, and hold this as the most binding obligation, accepting and taking for granted any additional clause which might make it still more so.

It was so declared and signed by his Excellency the Minister and also by Don José de Garay, and witnessed by Don Manuel Madariaga, Don Manuel Rojo, and Don José Mendoza of this city: which I certify.

J. M. DE BOCANEGRA.
JOSÉ DE GARAY.

FRANCISCO DE MADARIAGA,
Notary Public and National.

Engrossed duplicate at the request of Señor Garay, this 19th day of December, one thousand eight hundred and forty-three, in seven sheets, the first bearing the first stamp and the other the fourth.

Corrected;—the same parties being witnesses;—which I certify.

(Signed) FRANCISCO DE MADARIAGA,
Notary Public and National.

—
(No. 3.)

Communication from Don José de Garay to his Excellency the Minister of Foreign Affairs and Home Department, showing the progress of the work of exploration in the Isthmus, and soliciting to be put in possession of the waste lands granted to him by the decree, dated the 1st March, 1842, the Supreme Government being pleased also to declare included in them all the concessions previously made of any part of the said grounds which may have been forfeited in consequence of the parties not fulfilling their contracts.

MOST EXCELLENT SIR :

I, Don José de Garay, projector of the line of communication between the two seas intended to be established in the Isthmus of Tehuantepec, with due respect beg to submit to your Excellency, that in the fulfilment of my engagements to execute that undertaking, and in accordance with that which I made in the first part of Article 4, of the decree of the 1st March, 1842, since then committed to writing, I appointed and provided with every necessary means the Commissioners who investigated the locality, without sparing either labor or expense, which latter amounts already to a considerable sum. The results of this investigation are perfectly satisfactory, as your Excellency will see in the accompanying copy of the note which the secretary of the Commission addressed to me privately from the Venta de Chicapa on the 11th January last. The possibility of opening the projected communication is by these proceedings ascertained, a fact which cannot but be highly gratifying to the Supreme Government, so deeply interested in the execution of a work of the greatest importance to the aggrandizement of the Republic. My first engagement is, therefore, fulfilled. To fulfil the second, which must begin by marking out and opening the line of communication, levelling the ground, giving a different course to rivers, lakes, and creeks, and performing whatever is needful to realize the undertaking, the Supreme Government ought without delay to direct the civil authorities to place at my disposal the lands through which the road must pass from the bar of San Francisco in the south, to that of the Coatzacoalcos in the north, as well as of the uncultivated or unclaimed lands mentioned in the 5th Article of the said decree. This last clause is essential to the realization of the third part of the 4th Article, since without being able to commence immediate operations on hills, plains, and rivers, it will be impossible to fulfil the second part of my duties relative to the execution of the works.

The Supreme Government has seen the zeal with which I have attended to my engagements in the very fact of the investigation for which eighteen months were allowed having been performed in nine, notwithstanding the difficulties and drawbacks which the Commission had to encounter. It is the same spirit of activity and solicitude that urges me to make the above demand, especially as if, from want of the necessary orders, the Commission be needlessly detained a month longer, my expenses will be materially increased. According, then, to the above statement, and to the claims which my agreement gives me, I beg that the Supreme Government may be pleased to issue orders to put me in possession of the territory through which the works must be carried on, as well as for the fulfilment of the 7th Article of the above-mentioned decree of the 1st of March. I must, besides, call the attention of the Supreme Government to the circumstance that various portions of land on both shores of the river Coatzacoalcos, through which the line of com-

munication must pass, having been granted to colonists, it is natural that they will allege their rights as proprietors against those I have acquired by my engagements. These colonists, however, having neither cultivated nor peopled the lands which had been ceded to them for such purposes, have according to the laws of the country lost their right to the property, a fact which I request the Supreme Government in justice to myself will make public by a decree, lest I be involved in disputes and litigations after the outlay of large sums.

JOS. DE GARAY.

Mexico, February 9, 1843.

TO HIS EXCELLENCY THE MINISTER FOR FOREIGN AFFAIRS.

(No. 4.)

Official communication from his Excellency the Minister of Foreign Affairs to Don José de Garay, inclosing a copy of the orders given to the Governors of Oajaca and Vera Cruz, to place the untenanted lands at his disposal, and that every measure be taken to prevent his agents from suffering any obstacle in their operations.

OFFICE OF FOREIGN AFFAIRS.

SIR,

I subjoin a copy of the communications addressed this day to their Excellencies, the Governors of the Departments of Oajaca and Vera Cruz : " Most Excellent Sir, On the first of May of last year, the Provisional President published a decree granting to Don José de Garay an exclusive privilege to open a communication between the Pacific and Atlantic Oceans, in the Isthmus of Tehuantepec ; ceding to him, by Article the 5th, the possession of the untenanted lands that lay within ten leagues on each side of the projected road, and promising, by Article 7th, to render him every assistance in carrying on both the survey and the works. The survey is so far advanced as to allow the commencement of the works and other operations, without which a project of such magnitude would be thrown into jeopardy, greatly to the detriment of the Republic. His Excellency the Provisional President, having present these considerations and others which spring from the same decree, and wishing to render effectual the solemn promises made, has been pleased to direct me to inform your Excellency of the above, that your Excellency may give the necessary orders for the fulfilment of the 5th Article of the decree, by which Don José de Garay is to be put in possession of the untenanted lands that lie within ten leagues of both sides of the line of road, requesting, at the same time, that your Excellency will do all in your power not only to render effective the grant of lands as far as your Department is concerned, but also to give the assistance and protection promised by the Supreme

Government to Don José de Garay, so as to remove every obstacle likely to prevent or retard the execution of the plan.

It is essential that the Commissioners and other agents employed in the opening of this road, which must extend from the bar of the Coatzacoalcos on the North, to that of St. Francisco on the South, should be protected against everything that may prevent the performance of their duties, and in case any claims to ownership of lands should be put forth by private individuals, your Excellency will regulate your proceedings according to the obligation which the 4th Article of the decree imposes upon Don José de Garay. Full liberty must also be allowed him to give a different course to the River Coatzacoalcos and its tributaries, or any other rivers, lakes, or creeks, to clear their borders, and use the timber when not required to be felled on private ground.

To know how far it will be necessary to make use of private property, as well as to mark out the limits of the grant of territory awarded to Don José de Garay in the above mentioned decree, that gentleman is authorized to appoint land surveyors, who will be subject to no control but that of the officer whom your Excellency may be pleased to appoint, and intrust with instructions agreeably to this order, and the attendance of the adjoining land-owners, whose measurement will fix and determine his right of claim to possession. In case any proprietor of land refuses to give up his property in conformity with this decree, a valuation will immediately be set on foot, and according to it the land purchased for the undertaking.

The greatness of this enterprise merits every effort to promote its realization; and it is with this object that I have the honor to transmit this communication from his Excellency, the Provisional President, availing myself of the opportunity to assure your Excellency of my deep respect and consideration."

God and Liberty, Mexico, 9 February, 1843.
BOCANEGRA.

Señor Don José de Garay.

(No. 5.)

Decree by which the Government declares that all the Lands granted previous to the Decree of the 1st March, both to Natives and Foreigners, and which are neither tenanted nor cultivated, belong to Don José Garay.

OFFICE OF FOREIGN AFFAIRS.

To their Excellencies, the Governors of Oajaca and Vera Cruz.

(COPY) His Excellency, the Provisional President, has been pleased to publish the following decree:

Nicolas Bravo, General of Division, Benemeritus of the Country, and Provisional President of the Republic of Mexico, to all the inhabitants be it known:—That a grant having been made in favor of the undertaking to open a communication between the two oceans, through the Isthmus of Tehuantepec, of the untenanted lands lying within ten leagues on both sides of the line of communication, which, according to the surveys already made, must pass through the River Coatzacoalcos, and, wishing to remove every obstacle which might prevent or retard the realization of the undertaking, I have deemed it necessary, in right of the faculties which the 7th Article of the Convention, signed at Tacubaya, and sworn to by the representatives of the various departments, awards to the Supreme Government, to declare the following:

All the grants of land made either to natives or foreigners, previous to the decree of the 1st March, 1842, from among the untenanted lands mentioned in the 3d Article of the said decree, and which actually remain uninhabited and uncultivated, are comprehended in the concessions made in behalf of the undertaking for the communication of the two seas, therefore I do order this to be printed, published, and circulated, for the purpose of being fulfilled.

Palace of the Government of Mexico, February 9, 1843.

NICOLAS BRAVO.

J. M. de Bocanegra, Minister for Foreign Affairs.

A true copy of the original document transmitted to the Governors of Vera Cruz and Oajaca, which I inclose to you for your intelligence.

God and Liberty, Mexico, February 9, 1843.

Decree ordering 300 Convicts to be placed under the direction of Don José de Garay, to work in the projected Canal.

OFFICE OF FOREIGN AFFAIRS.

His Excellency the President has been pleased to issue the following Decree:

“ Antonio Lopez de Santa Anna, General of Division, Benemeritus of the Country, and Provisional President of the Republic of Mexico, to all the inhabitants be it known—That whereas the survey of the Isthmus of Tehuantepec has been concluded, and the works to open a communication between the two oceans about to be begun, and it being my wish to assist the director by every means in the power of the Supreme Government, I, by virtue of the prerogatives allowed me by the nation, decree as follows:

“ Article 1. A convict station shall be established with 300 convicts to be employed in the works of the canal.

“ Article 2. The judicial authorities of Vera Cruz and Oajaca shall send

to the said station all criminals sentenced to public works, until the number be completed.

"Article 3. The director of the undertaking will clothe and victual those 300 convicts, and provide them with tools on his own account.

"Article 4. The troops necessary to guard the station shall be provided by the military force of the Department where the said station may be established, and paid by the director of the undertaking."

And that this decree may be known, circulated, and fulfilled, I hereby order it to be printed.

National Palace of Tacubaya, October 4, 1843.

ANTONIO LOPEZ DE SANTA ANNA.

J. M. de Bocanegra, Minister for Foreign Affairs.

I have the honor to communicate this decree to you for your information and guidance.

God and Liberty, Mexico, October 6, 1843.

BOCANEGRA.

Señor Don José de Garay.

Decree granting to Don José de Garay the term of a year, according to his request, for the commencement of the Works.

(STAMP.)

I, the citizen Francisco de Madariaga, public notary of this Capitol, do hereby certify and bear witness that a decree, signed by his Excellency the Minister for Foreign Affairs, Don José María Bocanegra, was presented to me by order of Señor Don José de Garay, which is exactly as follows :

(SUPREME ORDER.)

OFFICE OF FOREIGN AFFAIRS.

SIR,

His Excellency the President *ad interim*, whom I acquainted with your request, that the period prescribed in the decree of March, 1842, for the commencement of the works in the Isthmus of Tehuantepec, should be postponed for the term of a year, has been pleased to determine in Council, this day, that the same shall be granted.

God and Liberty, Mexico, December 28, 1843.

BOCANEGRA.

Señor Don José de Garay.

This copy of the supreme order agrees with the original, which I have returned to the person who, in the name of Don José de Garay, presented it to me, which I hereby witness. And that it may be known to all whom

it may concern, I give this in the city of Mexico, on the 29th December, 1843.

Witnesses.—Don Manuel Madariaga,
Don Manuel Rojo,
Don José Mendoza.

(Signed) FRANCISCO DE MADARIAGA,
Public Notary.

Extract from a Decree of General Don José Mariano de Salas at the time exercising Supreme Executive Power, and dated at the Palace of the National Government, Mexico, 5th November, 1846.

ARTICLE 1. The Decree of 1st March, 1842, of the Provisional Government, which concedes to Don José de Garay the exclusive privilege of opening a line of communication across the Isthmus of Tehuantepec, so as to connect the Atlantic and Pacific oceans, is hereby confirmed.

ART. 2. The Decree of 9th February, which grants to the projector all the waste lands within ten leagues on either side of the line of the canal, is hereby confirmed.

ART. 3. The Decree of 6th October, 1843, which establishes a convict station to assist in the works to be carried on by the enterprise for effecting a communication between the two oceans, is hereby confirmed, with the understanding that it is not to be considered obligatory that the precise number of convicts shall be 300.

ART. 4. The term for the commencement of the works allowed to Don José de Garay, shall be further extended for two years more, to be reckoned from the date of the publication of this Decree.*

ART. 5. The rates for light-houses, pilotage, and for the transmission of letters, shall be fixed by a special law, analogous to the provisions of that of 1st March, 1842.

ART. 6. A compensation for all lands belonging to individuals, communities, or corporations, which may be found within the ten leagues on either side of the transit, shall be made to the enterprise in other waste lands it shall select in districts nearest to the Isthmus.

ART. 7. All colonists making settlements under the enterprise to carry out the project, shall be exempt from military service for the term of twenty years, excepting only in the case of a foreign invasion of the Isthmus.

ART. 8. They shall be similarly exempt, for the same period, from all contributions not in the nature of municipal taxes.

ART. 9. All implements intended for agricultural purposes, and instruments for the arts, shall be exempt from all duty for a similar term.

* It is proper here to observe that the works on the Isthmus were commenced within the time prescribed by the decree, and have since been continued.

ART. 10. All articles of subsistence, clothing, furniture, and other things useful for the construction and embellishment of houses, shall be exempt from all duties for the term of six years, to be computed from the establishment of the colony; but in case such articles should be intended for consumption in the interior, then they shall be subject to the general existing laws of the Republic.

ART. 11. All articles intended for the construction and repair of the line of communication shall be admitted free of duty, it being required, however, that they shall be subject to a previous examination.

ART. 12. No colonists shall be allowed to settle who are at the time citizens of a State at war with the Republic.

ART. 13. It shall be an express condition in all contracts with colonists, that they shall renounce the privileges of their original domicil so long as they reside in the country, subjecting themselves to all the existing colonial regulations which are not in conflict with the present law.

ART. 14. The enterprise shall submit for the approval of Government all contracts which it shall make for the introduction of families and laborers, and it shall keep a public and authentic register of all its transactions in respect to all matters of colonization.

ART. 15. The waters of all rivers and streams which empty into the canal, and serve to feed it, shall not be disturbed nor turned away in any part of their course, nor in their sources, so as to deprive the enterprise of the use of them. In case any person has a right to the use of the said waters at the present time, the enterprise shall indemnify such parties in the manner prescribed by the existing laws which regulate the appropriation of private property for public uses.

The following observations of Mr. Moro will show what instruments were used, and the processes pursued in obtaining the results exhibited in the annexed tables.

ASTRONOMICAL OBSERVATIONS.

By these, the latitudes of eleven places and the longitude of Juchitan were determined, and many azimuths taken. The instruments employed were Borda's repeating circle of $0^{\circ}35$ diameter, constructed by Gambez; the reflecting circle, by Cary, of $0^{\circ}20$ diameter; two sextants, one by Gambez, of $0^{\circ}20$ radius, and the other by Cary, of $0^{\circ}15$ radius; and two chronometers, by Roskell, Nos. 171 and 301.

Observations at Juchitan.—The latitude was determined with the greatest care by circum-meridian altitudes of various stars, and that of the Polar star, taken out of the meridian, using the circle of Borda for these

observations, as well as for the altitudes of the sun and of several stars noted for the purpose of regulating the chronometers. The observations here given will show the degree of confidence which may be placed in the calculation of the mean rates.

6 circum-meridian altitudes of Fomalhaut (November 3, 1842),	.	.	.	.	.	.	.	16° 26' 15" N.	
20 of the Polar star (November 3),	.	.	.	.	.	.	16	26	6
12 of ζ Grux (November 4),	.	.	.	.	.	.	16	26	6
12 of Achernar (November 4),	.	.	.	.	.	.	16	26	14
8 of Canopus (February 18, 1843),	.	.	.	.	.	.	16	26	3
2 series of observations of the Polar star out of the Meridian	.	.	.	.	.	.	16	26	9
Mean of these 70 observations	.	.	.	.	.	.	16	26	8.3
Difference of the place where the instrument was situated and the apex of the cupola of the church,	.	.	.	.	.	.	0	0	1.7
Latitude of the cupola	.	.	.	.	.	.	16	26	10

Not having had the opportunity of observing the occultation of any star by the moon, the longitude was determined by culminations of one of its limbs with the stars Spica Virginis, Antares, and Regulus, observed by the telescope of the circle placed nearly in the plane of the meridian, and the following results were obtained :

<i>Longitude of Juchitan west of Greenwich,</i>								
by comparison with Spica (February 17),	.	.	.	.	.	.	6 ^h 20' 27"	
“ “ with Antares (February 21),	.	.	.	.	.	.	6 20 50	
“ “ with Regulus (March 13),	.	.	.	.	.	.	6 20 43	
“ “ “ (March 14),	.	.	.	.	.	.	6 20 34	
Longitude of Juchitan	.	.	.	.	.	.	6 20 38.5	
In degrees	.	.	.	.	.	.	95° 9 38.5	

From the roof of the church, on the 2d, 3d, and 4th of November, 1842, several series of angles were observed by the theodolite between one of the limbs of the rising sun and the signal at Umalalang, to determine the azimuth of the latter ; and noting the time by one of the chronometers, the rate of which was well ascertained, it gave 48° 44' 30" from South to East.

San Mateo del Mar.—The latitude of this village, deduced from a series of ten circum-meridian altitudes of the moon, taken by Mr. Moro with Cary's sextant, on the 16th of August, 1842, is 16° 12' 47," which differs only 7".5 from that obtained by the triangulation.

San Dionisio del Mar.—The latitude of this place was determined by three series of circum-meridian altitudes of the sun, giving the following results :

1st series of 20 observations (October 11, circle of Cary),	16° 16' 36"
2d series of 16 observations (October 13, circle of Gambey),	16 16 22
3d series of 22 observations (October 16, circle of Cary),	16 16 30
Mean of the 58 observations	16 16 29.8

The latitude, taken graphically on the plan at the spot laid down from two secondary triangles, gives 16° 16' 32".

San Juan Guichicovi.—On the 7th of February a series of ten circum-meridian altitudes of the sun was taken with Cary's circle, and the latitude deduced from them was 16° 58' 35". On the morning of the same day, and on the previous evening, azimuths were astronomically taken of various points visible from the church and a small neighboring hill, of which the longitude was ascertained to be 4° 15" west of Juchitan.

The remaining seven latitudes of places determined by the Commission are those of Santa Maria Chimalapa, Hidalgo-titlan, Mina-titlan, Paso de la Puerta, the strand of Jumuapa, the south point of the Island of Pedernal, and the Horqueta de Tacanichapa; the first by six circum-meridian altitudes of Sirius, the second by eight of the sun, and the others by simple meridian altitudes of the sun, taken with the sextant of Gambey. These latitudes will be found with the former in table No. 1. A.

In addition to the above, several azimuths were obtained at various points corroborative of the observations taken at Juchitan.

Observations of the temperature and atmospherical pressure were also noted at the same time, the whole of the calculations being made with the greatest care and exactness, from data furnished by the British Nautical Almanac.

The commissioners regret that the observations were not more numerous, especially in that part of the country where the triangulation was most difficult; but even such as have been made were only obtained by the most arduous labor. From the frequency and force of the northerly winds, it became impossible to use the artificial horizon, and consequently the reflecting instruments; and even Borda's circle was employed with much difficulty, on account of the continued heavy rains which fell on the mountains at the season of the year when this survey took place. Three successive attempts were made to determine the latitude of Santa Maria Chimalapa. The two first proved quite unsuccessful, having in one instance fruitlessly waited eight days for an opportunity to effect our purpose; and even on the third occasion five days elapsed before we could accomplish our object. At many other places we also waited in vain for favorable weather to make our observations.

Throughout the whole of these labors, I was greatly assisted by the

lamented Captain Gonzalez, whose ardent zeal could not be restrained, even in the midst of rapidly declining health.

GEOGRAPHICAL POSITIONS OF THE TRIGONOMETRICAL POINTS.

The azimuth of the signal at Umalalang, observed from the cupola of Juchitan, with the latitude of this latter point, served for the calculations of the geographical positions of the vertexes of the principal triangles found in Table No. 2, Appendix A.

In these calculations, as well as in the trigonometrical levels, and the construction of the maps, the value of the terrestrial ellipticity has been assumed at $\frac{1}{317}$, as deduced by La Place from the influence which our planet exercises over the moon's motion, and which differs but little from $\frac{1}{333}$, which has lately been found by Mr. Puissant to result from the several geological operations.

The longitude of Juchitan having been determined astronomically, and this point made the basis for all the other positions, their longitudes have been referred to it, both in the table and maps.

LEVELS TAKEN TRIGONOMETRICALLY.

The altitudes above the level of the sea, contained in Table No. 3, have been calculated by zenith distances observed with Borda's circle from the summits of Daniguiati, and Palo Blanco, and the church of Juchitan, and from the horizontal distances derived from the triangulation. At Daniguiati, a series of ten observations of the horizontal depression of the sea was taken, and by them the height was determined to be 274.5 metres above it, allowance being made for the height of the tide at the time of observation.

The height of Juchitan was ascertained by the preceding, and by two series of observations at that place, and two more at Daniguiati ; that of all the following points, as far as Palo Blanco, was determined by observations made at Juchitan.

Lastly the height of Palo Blanco, and the zenith distances observed from its summit, served for finding all the points.

Not less than six series of observations were taken at each time for determining the heights ; and for the most important, as many even as twenty-four.

In order to calculate the co-efficient for the refraction, meteorological observations were made, which being applied by the prescribed formula (see the *Geodesie de Puissant*, 3me. edition, liv. 3me. par. 271), gave the following results :

Values of the co-efficient for refraction.

For observations made at Daniguiati	0,0715
“ “ “ Juchitan from	0,0723 to 0,0727
“ “ “ Palo Blanco from	0,0684 “ 0,0716

It must be observed, that the situation of the highest peak of the Sierra having been laid down by means of sights taken from distant points, which, in consequence of the peculiar form of the mountain, may not always have been directed to the same spot, there may be an error of position, amounting perhaps to 1,000 metres, which would also occasion another of 45 metres in the altitude.

LEVELS TAKEN BY THE BAROMETER.

The Commission simultaneously took levels with the barometer, using those constructed by Cary well compared together, and the results are stated in Table 4. The heights of the three first points have been ascertained directly from the level of the sea, by comparing those of Umalalang and Daniguibixo with the result of the geodetical measurements. In both cases we found only the small difference of two metres, the trigonometrical height of Umalalang being less than that given by the barometer, whilst in the case of Daniguibixo it was the reverse.

The height of the Venta de Chicapa is the mean of four series of observations differing but little from each other, which were made simultaneously at that place and at Tarifa, and this last is included in the geodetic levelling.

All the other places, with the exception of the four last, which we took separately, were ascertained by simultaneous observations made at each of them, and at Tarifa, or the Venta; and those of greater importance by two series at least. The altitudes of San Miguel Chimalapa and Chivela were calculated respectively from each other, and the results were without any sensible difference, equal to those obtained by means of simultaneous observations consecutively made at each of these places, and at Tarifa.

All the isolated observations were eventually compared with the means of those previously and subsequently made at the Venta.

On verifying the different results, the Commissioners are of opinion that barometrical observations determine the *differences* of levels very approximately, when made with due precaution. It is above all things requisite to study well the nature of the country, to ascertain the most favorable circumstances for making observations, since the form of the land separating two stations may impede the equalization of atmospherical changes, and thereby produce considerable errors.

The north wind, which frequently blows over the Isthmus, brings with it the clouds formed in the Mexican Gulf, and these are discharged upon

the low grounds of the Coatzacoalcos, towards the northern side of the Sierra and its principal summits, whilst above the opposite slope and over the plain, which extends from the foot of the mountains to the shores of the Pacific, the sky remains constantly clear. If under these circumstances barometrical observations are made simultaneously on both sides of the Sierra, on the side of the gulf they will exhibit a lower elevation than the true one, the error being the greater as that station may happen to be lower down or more towards the north; but if time should admit of waiting until the weather be equally fine on both sides (which seldom happens), then the difference between the levels of the barometrical columns is insensible. Hence we are unable to give the altitudes of many places, where observations were made.

A.

ASTRONOMICAL OBSERVATIONS.

TABLE No. 1.

Latitudes determined from astronomical observations.

Cupola of the church of Juchitan	16° 26' 10"
Church of San Mateo Huazontlan del mar	16 12 47
Id. San Dionisio Tepehuazontlan	16 16 30
Id. San Juan Guichicovi	16 58 35
Id. Santa Maria Chimalapa	16 55 5
Paso de la Puerta	17 12 35
The strand on the right bank of the Coatzacoalcos below the mouth of the river de la Puerta (or Jumuapa)	17 21 5
South point of the island of Pedernal	17 27 45
Horqueta of the island of Tacamichapa	17 43 "
Hidalgo-titlan	17 46 36
Mina-titlan	17 58 55

TABLE No. 2.

Geographical positions of the principal points of the Triangulation.

The longitudes are reckoned from the meridian of Juchitan, which is $95^{\circ} 9' 37''$.⁵ west of Greenwich.

	North Latitudes.	West Longitudes.
Cerro del Morro	$16^{\circ} 10' 24''$	7° 57"
Xunirahui	16 12 40	13 10
Danigubixo	16 14 36	7 16,5
Town of Huilotepec	16 14 54	7 42
Daniliesa (Cerro de la Cueva)	16 20 7	13 16
Daniguibedchi (Cerro del Tigre)	16 20 10	11 55
Parish church of Tehuantepec	16 22 16	12 24
Danigú or Camotepec	16 22 6	3 44
Church of Espinal	16 29 26	1 18
Id. of Íztaltepec	16 30 27	1 57
Daniguati	16 31 59,5	3 50
Cerro de Laollaga	16 32 32	12 51,5
Church of San Gerónimo	16 34 20	4 29

	<i>North Latitudes.</i>	<i>West Longitudes.</i>
Church de Chihuitan	16 35 44,5	8 16
Guievichi	16 37 26	5 30
East summit of Huacamaya	16 42 28	1 15,5
Guievixia	16 43 8	5 15
Pico del Aymoloya	16 44 8	3 48
Church of Barrio	16 48 40	5 18
Id. Petapa	16 49 36	5 48
Id. Santo Domingo	16 49 45	7 5
		<i>East Longitudes.</i>
Church of San Mateo Huazontlan del mar	16 12 52,5	2° 31"
Huachilailf	16 13 32	23 49
Church of Santa Maria del Mar	16 13 33	9 56,5
Summit of Baxmumbah	16 14 42	22 27
Id. Malumbiamlaif	16 14 59	24 31
Island of Tilema	16 15 30	7 33
Summit of Umalalang	16 16 39	11 13,5
Id. Mitiachuaxtoco (cerro de Santa Teressa)	16 17 10	13 22
Island of Monapostiac	16 20 34	7 13
Mitiacix or Cerro de la Iguana (islaud)	16 23 9	9 28
Tiactinayix	16 26 12	13 40
Cerro del Zopilote	16 26 31	31 36
Hacienda (estate) of the Venta de Chicapa	16 34 "	12 14
Cerro del Lagartero	16 34 15,5	6 25
Summit of the Pié de Banco	16 34 41	20 29,5
Pico de Rinconchapa	16 37 13	11 14
Cerro de Paloblanco	16 38 17,5	13 51
Id. of Zapata	16 39 5	15 3
Summit of Piedra Parada	16 39 8	9 34
East peak of Cerro Prieto	16 39 41	2 3
The bare hill to S. S. E. of San Miguel Chimalapa	16 42 11	16 14
Summit of Paso Partida	16 42 17	11 28
Church of San Miguel Chimalapa	16 43 "	16 33
Cerro del Convento	16 43 11	12 15
Peak of the Cerro Atravesado	16 43 12	30 8
Hacienda of Tarifa	16 43 31	8 57
Cerro de Albricias	16 44 21	15 49
Summit of Chichihua	16 44 34	12 57

TABLE No. 3.

Altitudes resulting from Trigonometrical measurements.

	<i>Heights above the level of the sea.</i>
	<i>Metres.</i>
Summit of Daniguati	274.5—in feet to 900.60
Top of the Cupola of the Church of Juchitan	35.8 " " 117.45
Basement of the same church	18 " " 59.06
Monapostiac	111 " " 364.18
Umalalang	218 " " 715.24

		<i>Heights above the level of the sea.</i>
	Metres.	
Daniguibixo	298	in feet to 977.71
Guievichi	416	" " 1364.86
East peak of Cerro Prieto	460	" " 1509.21
Guievixia	598	" " 1961.98
Masahua (the middle summit)	687	" " 2253.98
East summit of Huacamaya	775	" " 2542.69
Cerro de Laollaga	1243	" " 4078.16
Palo Blanco	371	" " 1217.21
Estate of Tarifa (the place of the habitations)	208.5	" " 684.07
Cerro de Piedra Parada	416	" " 1364.86
Cerro del Convento	446	" " 1463.28
Paso Partida	466	" " 1528.89
Masahuila	615	" " 2017.75
East summit of Masahua	696	" " 2283.51
Guievila	1152	" " 3779.60
Peak of the Cerro Atravesado	1529	" " 5016.50
The highest peak beyond it	2343	" " 7687.15

TABLE No. 4.

Barometrical Altitudes across the Isthmus of Tehuantepec.

	<i>Heights above the level of the sea.</i>	
	Metres.	
Umalalang	220	in feet to 721.80
Mitiachuaxtoco	250	" " 820.23
Daniguibixo	296	" " 971.16
Venta de Chicapa (house at the Estate)	24	" " 78.74
The river Chicapa, near the Rancho of la Puerta vieja	83	" " 272.31
The river Coatzacoalcos at the confluence of the Chimalapilla	119	" " 390.43
Source of the stream Monetza	196	" " 643.06
Petapa (the town house)	204	" " 669.30
The river Chicapa, at the Ultimo Rancho	208	" " 682.42
Farm of Chivela	210	" " 688.98
Source of the river Almoloya	225	" " 738.19
Santo Domingo (the town house)	226	" " 741.47
El Barrio (the town house)	232	" " 761.16

Road from Santa Maria to San Miguel Chimalapa.

San Miguel Chimalapa (the town house)	119	" " 390.43
Rancho de la Cofradia	376	" " 1233.62
The stream running towards Chichihua, and often traversed	275	" " 902.24
Jacal del Ocotal	331	" " 1085.98
Pass of the river of Chichihua	189	" " 620.09
Pass of the river Escolapa	150	" " 492.14
Jacal del Chocolate	326	" " 1069.58
Pass of the rivers del Milagro	84	" " 275.59
Santa Maria Chimalapa (the town house)	262	" " 859.59

				<i>Heights above the level of the sea.</i>
				Metres.
La Piedra del viejo (the highest point between Santa Maria and the river)				296—in feet to 971.16
The river del Corte, at the confluence with the Chimalapa- pilla				119 " " 390.43
Tehuantepec				42 " " 137.80
Zanatepec				50 " " 164.05
San Gabriel Boca de Monte				50 " " 164.05
San Juan Guichicovi (the town house)				249 " " 816.95

TABLE No. 5.

*Heights above the level of the sea of various places on the road from Tehuantepec
to Puebla.*

	Metres.
Tequixistlan	210—in feet to 688.99
Rancho de las Vacas	745 " " 2444.27
San Bartolo Yantepec	870 " " 2854.38
Rancho Quemado	1160 " " 3805.84
San Pedro Totolapan (the lowest part of the town) . . .	940 " " 3084.05
City of Oajaca	1535 " " 5036.18
San Juan del Estado	1680 " " 5511.91
Venta de Aragon	1005 " " 3297.30
Cuicatlan	420 " " 1377.98
City of Tehuacan	1575 " " 5167.42
Tlacotepec	1905 " " 6250.11
Tepeaca	2210 " " 7250.79

B

G E O L O G Y .

*Catalogue of the Geological Collection formed in the Isthmus of Tehuantepec by the Scientific Commission intrusted with the exploration of the Isthmus, and classified by Señor Don Andres del Rio.**

SIERRA MADRE (PRINCIPAL CHAIN) AND NEIGHBORING HILLS.

NON-STRATIFIED ROCKS.

1. Milk quartz with a resino-vitreous lustre, and with the cleavage of the rhombohedron very distinct, found near Chivila.
2. Decomposed granite, near the Hacienda de Tarifa.
3. Granite, found in the descent from the Portillo de Tarifa to the plain of the Venta de Chicapa.
4. Granite in pebbles in the upper course of the Coatzacoalcos.
5. Syenite, also in pebbles, in the same spot.
6. Syenite, at the foot of the Sierra, at little less than midway from Niltepec to Zanatepec.
7. Dioritic porphyry, or porphyritic greenstone, in the descent from Guichilona to Chihuitan.
8. Hypersthene rock, found in the heights which surround the source of the stream Zopiluapa, cutting at intervals the calcareous rock.
9. Antique porphyry, with crystals of feldspar, tinted with chlorite and ferruginous clay from the hillock of Guichicovi.
10. Clay-stone porphyry from the summit of Cerro Atravesado.
11. Magnetic iron ore from the hills of Niltepec.

STRATIFIED ROCKS.

12. Quartz rock, found in the descent from the Portillo of Tarifa to the Rancho de la Agua Escondida.
13. Quartz of a chipped texture, from the Paso del Ostuta on the road to Zanatepec.
14. Quartz breccia, resting on the porphyry in the summit of the Cerro Atravesado.
15. Greenstone schist, hornblende rock of Lyell, peak of Guiévixia.
16. Grey-wacke schist: descent from Guichilona to Chihuitan.
17. Grey-wacke, from the hills of Barrio.

* Don Andres del Rio did not accompany the expedition to the Isthmus, but made this classification from the specimens procured there by the gentlemen intrusted with the survey.

18. Clay-slate, with the appearance of pearl-stone, resting on the quartz in the summit of the Cerro de Espinosa.
19. Clay-slate, from the Portillo de Tarifa.
20. Clay-slate, found in the descent from the Portillo to the plains of the Venta.
21. Clay-slate, also with the appearance of pearl-stone, on the summit of Paso Partida.
22. Clay-slate, in the gap between the above-named hill and that of Convento, on the road from Tarifa to San Miguel Chimalapa.
23. Clay-slate, on a hill on the road from Tarifa to the Cienaguilla.
24. Greenstone schist, found in the summits of Palo Blanco, mixed with fragments of quartz.
25. Greenstone schist, in the pass of the Chicapa, near the Rancho of Puerta Vieja, on the road from the Venta to San Miguel.
26. Greenstone schist, from the heights of the Upper Chicapa.
27. Greenstone schist, changing to dioritic, from the ascent to San Miguel Chimalapa.
28. Grey-wacke schist, from the hills between the river Malatengo and the ancient estate of Kochiapa, on the road to Boca de Monte.
29. Talcose schist, from the brow of the Sierra in the ascent from Niltepec to the Cerro Atravesado.
30. Clay slate, from the foot of the Cerro half way between Niltepec and Zanatepec.
31. *a* and *b* Clay-slate and talcose schist, from the banks of the Upper Ostuta.
32. Dolomite limestone, found in a hillock at the foot of the hills of Laollaga.
33. Compact limestone, with veins of calcareous spar, found near the slate in the neighborhood of the Rancho del Zapotal.
34. Compact limestone, which breaks into thin sheets in the descent from the Portillo to the plains of the Venta.
35. Calc. tuff? from the same spot.
36. Compact limestone, and occasionally stink stone, with veins of pearl-spar, from the Convento Chico.
37. Compact limestone of the Convento Grande ; in one of the pieces there is a vein of calcareous spar, with fragments of diorite.
38. Quartzose sandstone, from Daniguati.
39. Argillaceous sandstone, from Guievichi.
40. Sandstone, partly quartzose and partly argillaceous, near the estate of Chivela.
41. Sandstone schist, from the table-land of Tarifa.
42. Sandstone, from the foot of the small hill of Guibicia.
43. Sandstone, from the Piedra Parada of Daningadchi.
44. Argillaceous sandstone, from the foot of the Sierra half-way between Niltepec and Zanatepec.
45. Claystone, which may change to jasper, on the road to Santa Maria Chimalapa, between the river Escolapa and the Chocolate.
46. Jasper, found in pebbles in a strand of the Upper Coatzacoalcos.
47. Argillaceous stone in layers, little inclined, resting on the porphyry, No. 9.
48. Guigosina stone.
49. Calcareous stone with a circular design, found on the brow of the hills of Masshua, in the source of the stream Tolistoco.
50. Calcareous stone with cavities, resting upon another similar to that on the Cerro del Convento.
51. Variegated marls resting upon sandstone, on a hillock near the Hacienda de la Chivela.
52. Earthy marls, taken from a cavity in the calcareous rock on the ascent to the Portillo de la Chivela.

53. Common marl lying over the sandstone No. 38.
54. Calcareous breccia, on the road from the Venta to San Miguel.
55. Pearl-stone breccia, found in loose fragments in the stream followed in going from Zanatepec to the Upper Ostuta.
56. Lamellar specular iron ore, from the neighborhood of Tarifa.

BANKS OF THE RIVER COATZACOALCOS.

57. Sandstone with a base of ferruginous clay, from above the confluence of the river Chimalapilla.
58. Greenstone rock, from a rapid a little before Angostura.
59. Metamorphic, or primary limestone, from the bank of the river a little below the mouth of the Malatengo.
60. Decomposed granite, from the great rapid below the old landing-place of Mal-Paso.
61. Clay, from the small hills on the banks of the river in its lower course: *a* from the hill of Oajaqueña; *b* from that of Churriagao; *c* from that of Peñas Blancas.
62. Clay in layers, alternating with others of sand, at Juchitan, twelve metres below the alluvial soil which covers the plain.
63. Calc tuff, from the margin of the fountain of Agua Caliente.

HILLS NEAR THE LAGOONS AND ISLANDS IN THE UPPER LAGOON.

64. Grey-wacke, very finely grained, of the island of Iguana or Mitiacix.
65. Porphyry, with basis of jasper, from the Mitiacxocueu.
66. Porphyry, with basis of argillaceous stone, from the summit of the hillock of Potrero.
67. Trachitic porphyry, with small veins of chalcedony, from Danigu.
68. Conglomerate of argillaceous base, from the small ravine of Chico Zapote or Endedchina, near to Danigu.
69. Jasper, from the small heights near those of the Potrero.
70. Dioritic porphyry, of the Manguixtia.
71. Porphyry, from the summit of Umalalang.
72. Syenite greenstone, from the island of Monapostiac, in large separate pieces.
73. Stratified greenstone, from the Natartiac or Cerro Prieto.
74. Fine-grained granite in veins, from the same hill, intersecting the former rock.
75. Greenstone, from the same, resembling basalt, and taken from near the veins.
76. Greenstone, with veins of tremolite, from the hill of Santa Teresa or Huaxtoco.
77. *a* Greenstone, from the hill near to the Hacienda de Santa Teresa, intersected by veins of the granite *b*.
78. Conglomerate of fragments of greenstone, from the brow of the Umalalang.
79. Argillaceous conglomerate, from the foot of the southern slope of the Maloxuet.
80. Prase, found under the slate in the same hill.
81. Grey-wacke, from the small hill of Umalpotate, at the foot of the former.

SIERRA DEL MORRO, AND HILLS NEAR TEHUANTEPEC, HUILOTEPEC, AND SAN FRANCISCO.

82. *a* Ancient porphyry, with veins *b* of red iron and hydrate of iron, from the Cerro de la Cueva.
83. *a* and *b*, the same porphyry also, with veins from the Cerro del Morro.

84. Dioritic porphyry, intersected by veins of syenite *b*, from the Cerro del Tigre, or Daniguibedchi.
85. Finely-grained syenite, from the hills of San Diego.
86. Syenite, and another rock composed of quartz and albite, from the Huilotepec or Daniguibixo.
87. Graphic granite of the hills of Huazontlan.
88. Veins of porphyry, altered by the fire of the hills of the Morro.
89. *a*, Dioritic porphyry of the Baxmumbah; *b*, granite from a fragment which intersects and partly covers the dioritic porphyry; *c*, new granite in veins, which intersect the two previous rocks.
90. Granite and syenite, from the Malnagirastiac.

C.

STATISTICS.

In the text it has been stated that laborers could be procured in abundance in the Isthmus. In support of this statement, reference can be had to the following tables. The statistical returns of the population were obtained from the most reliable sources. The Indians, particularly the Zapotecos, are hardy, industrious, and docile in their dispositions, and would be found useful laborers in any artificial work undertaken through the Isthmus.

TABLE No. 1.

Notice of the towns and villages in the southern division of the Isthmus of Tehuantepec, with their respective census, from the account furnished to Don Pedro de Garay by the Prefect of that district.

Names of the towns and villages.	Census.
Tehuantepec—town	8034
1. Santa Catalina Mistequilla	247
2. Tlacotepec	252
3. Santiago Laodaga	153
4. Santo Domingo Chihuitan	533
5. San Gerónimo	805
6. Itztaltepec	1546
7. Espinal	504
8. Juchitan	4567
9. Huitolotepec	185
10. San Mateo del mar	1500
11. Santa Maria del mar	148
12. San Dionisio del mar	888
13. San Francisco del mar	287
14. Zunatapec	336
15. Niltepec	626
16. Tapantepetec	321
17. San Miguel Chimalapa	318
18. Santa Maria Chimalapa	524
19. Santa Maria Petapa	1447
20. Santo Domingo Petapa	626
21. Barrio de la Soledad	999
22. San Juan Guichicovi	5000
23. San Gabriel Boca de Monte	71
	30845

TABLE No. 2.

Notices of the towns and villages of the northern division of the Isthmus of Tehuantepec, their respective census and the number of head of cattle in each, according to the data furnished by the statistics of the state of Vera Cruz, published in 1831.

Names of the towns and villages.	Inhabitants.	Oxen.	Horses.	Mules.
San Martin Acatucam (villa)	1902	267	949	50
1. San Andres Sayulitepec	1206	—	—	—
2. Tejistepecue	2132	—	88	—
3. San Juan Oluta	650	—	—	—
4. Santa Ana Soconusco	1611	—	46	—
5. Jaitipan	1302	88	238	—
6. Cosolacaque	1585	303	53	—
7. San Pedro Joteapa	1665	16	40	—
8. Santiago Mecayapa	736	—	55	—
9. Santa Maria Minsapam	773	—	—	—
10. San Juan Chinameca	779	3679	906	45
11. Otespam	857	147	33	—
12. San Cristobal Ishuatlan	497	500	21	—
13. Santiago Molocan	624	—	—	—
14. Minatitlan and neighboring ranchos	400	?	?	?
15. Hidalgotilan and its ranchos	360	?	?	?
	17038	5000	1726	95

TABLE No. 3.

Notice of the haciendas and rancherias in the northern division of the Isthmus of Tehuantepec, with their census and number of head of cattle respectively, from the data furnished by the statistical account of the state of Vera Cruz, published in 1831.

Names.	Inhabitants.	Oxen.	Horses.	Mules.
Rancheria de Michapa	325	230	160	—
Idem del Encinal	382	—	35	—
Coyote				
Gueñipam				
Rancherias { Jalapa	450	—	—	—
Cosaguilapa				
Lechonal				
Hacienda del Pedregal	20	100	—	—
Idem del Calabozo	63	—	—	—
Id. de Santa Catalina	210	1000	30	2
Id. de San Juan B. Nopalapam	435	30000	4000	180
Id. de Cuatitolapam	716	19000	4000	285
Rancheria de la Malota	237	—	—	—
Id. de Corral Viejo	81	—	—	—
Id. del Paso de San Juan	264	—	—	—
Hacienda de Solcuautla	123	5000	—	—
Id. de Santa Catalina de los Ortizes	133	1300	360	18
Id. de San Felipe	254	—	—	—
Rancheria de los Quemados				
Camahuacapa				
Rancherias { Correa	165	513	73	—
Casas Viejas				
Hacienda de los Almagres	49	2200	200	8
Idem de San Antonio	9	400	90	4
Id. de San José Teposapa	7	2400	10	2
	3973	62143	8938	499

TABLE No. 4.

Summary of the statistical notices respecting the number of inhabitants and head of cattle in the Isthmus of Tehuantepec.

Divisions.	POPULATION.	CATTLE.		
		Oxen.	Horses. and Mules.	Sheep.
Southern part of the Isthmus	30,845	44,135	11,260	1500
Northern part	20,011	67,143	25,000	230
Total	51,856	111,278	36,260	1730

Notes. In all the proper names of places mentioned in the preceding Report whenever the letter *z* occurs it ought to be pronounced as the French *é*, or the English *é*, this sound having been expressed by an *z* in all the Mexican dictionaries from the period of the conquest.



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